LIFE & WORK SERIES

A BRIEF SKETCH
OF
SOCIAL & INDUSTRIAL HISTORY

EDWARD CRESSY

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A BRIEF SKETCH OF SOCIAL AND INDUSTRIAL HISTORY

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A BRIEF SKETCH
OF
SOCIAL & INDUSTRIAL HISTORY

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BY

EDWARD CRESSY

AUTHOR OF "AN OUTLINE OF INDUSTRIAL HISTORY"

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PUBLISHERS' NOTE

By the Education Act, 1918, provision is made for a large extension of the work of the Elementary School. Central Schools may be established in which, at appropriate stages, practical instruction suitable to the ages, abilities, and requirements of the better pupils must be given. Courses of advanced instruction for older pupils remaining at the elementary school beyond fourteen years of age must be provided, and measures taken for the preparation of those children who desire further education in schools other than elementary. It will be necessary also to arrange for a sufficient supply of continuation schools for young people between fourteen and (at present) sixteen years of age, the instruction in which must extend, within the working day, to 280 or 320 hours in each year, at the option of the local education authority.

A new type of book will be required for purposes of instruction in the new schools created by the Act; and the Life and Work Series is intended to supply it. The volumes in the series will be designed to satisfy two distinct ideals—one cultural and the other utilitarian or vocational—and in both cases the appeal will be through interest. It is not necessary to accept Rousseau's doctrine that a pupil should learn no lesson of which he does not feel the present need, yet he must have a consciousness of value if a dynamic response is to be secured. While the aim of education is to train young people to be worthy and working members of the community, the immediate task of the teacher is to detect incipient growth towards the light and to encourage it.

Contact with life and work will, therefore, be the common bond of the series. Compulsory attendance at school may be prescribed, but compulsory attention must come from the pupil's own being, and it can be just as successfully and usefully stimulated by the wonders or achievements of science and industry as by masterpieces of art and literature. Interest in the principles and processes of daily work is as worthy as a regard for what are called cultural studies, and both will foster a desire for further knowledge. Citizenship implies not only duty towards life in the community but also efficient work on its behalf on the part of the individual. It is hoped that the volumes in this series will, by their close touch with reality, satisfy the vital needs of young students and provide the nurture and stimulus which are the essential functions of all educational effort.

PREFACE

This little volume has been prepared in response to requests for a book similar in scope and outlook to the author's *Outline of Industrial History*, but somewhat shorter and more simply expressed. As in that volume, the whole period of the history of man in this country is covered, because History is continuous and all movements have a beginning. The early period of English history is only lightly treated, since its interest is mainly academic; three-quarters of the available space is devoted to the events of the last two centuries because these are of greater importance in explaining the industrial organization, social conditions, and politics of to-day. These events, in fact, form the raw material out of which the constructive ideas of industrial citizenship have been evolved.

While the treatment is necessarily, to a large extent, episodal, it is hoped that the Time Charts will help to a clear apprehension of historical sequence, and show the inter-relation—especially in later times—of invention, social conditions, and Parliamentary action.

Questions, which are somewhat unusual in a book of this kind, are appended to each chapter; readers who wish to fix the landmarks in their minds should answer these questions immediately after reading the chapter, and then construct for themselves a chart to show the historical sequence and relationships. The framework thus acquired is essential, not only for a thorough understanding of the outlines of the subject, but also to provide a foundation for future deeper and broader study.

E. C.

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CHAPTER I

INTRODUCTION

Life of Primitive Man—the Hunting Stage. The most primitive men who exist in the world to-day live by hunting and fishing, and vary their diet by roots or fruits from the solitary plant or the forest glade. So, too, the earliest men of whom we have any record were hunters and fishermen. The caves which they made their homes contain weapons and bones that speak of the chase, and rough sketches on bone or stone that tell of the beasts they slew. That they clothed themselves in skins sewn with gut by the aid of a fish-bone needle is not improbable, because the needle has survived to tell the tale. Moreover, they were acquainted with fire, which they used to cook their food, to protect themselves against wild animals and winter's cold, and to dispel the darkness in which unknown dangers lurked.

Living at first in single families, those families which were closely related soon formed groups or tribes, not merely because that plan afforded greater protection but because man is a gregarious animal. He likes company and enjoys the society of his fellows. His advantages over the beasts were many. Apart from the use of fire he was in the habit of walking on his hind legs, so that his hands were free to do what his brain suggested. His power of speech again enabled him to communicate more fully and freely with those around him. He could not merely imitate; he could criticise. So that living in groups meant far more to him than to other denizens of hill and valley and open plain. To them it meant protection only. To him it meant intellectual and material progress which bore him rapidly above the savagery of his surroundings. The animal kingdom in general adapted themselves to Nature, but man adapted Nature to his own needs.

In those days men worked because they were hungry and, in northern latitudes, because they were cold. Yet, although it was a joyful open-air life, full of excitement and change of scene, it had drawbacks. For sometimes food would be plentiful and sometimes it would be scarce. One day men ate more than was good for them, and a few days later they would suffer the pangs of hunger. With stomachs of limited capacity and bodies requiring regular nourishment they found what few boys believe, but every one has to learn, that "little and often" is a golden rule. Monday's dinner did not last until Thursday's breakfast, and the attempt to lay in sufficient to cover the unknown interval between meals was probably painful, and must certainly have resulted in discomfort.

The Pastoral Stage. Of course flesh could be salted and carried about; but salt was sometimes scarcer than meat, and in any case the process involved labour which from time immemorial man has tried to avoid. So some man conceived the idea of making his meat walk on its own legs, and the practice arose of keeping flocks and herds of those animals whose flesh was most highly prized. Thus man passed from the Hunting to the Pastoral stage of existence.

And many of them stopped there. The world was very empty then and there was plenty of room. Men liked the free open-air life, and the change of scene in moving from one place to another in search of fresh pastures ; they hunted a little when opportunity arose ; and they found plenty to do in looking after the animals they had taken under their care. Further, having tamed these animals they began to use them as beasts of burden. Tents, tools, weapons, skins for clothing, utensils for cooking, and other possessions were laid on a skin and the skin hauled along by an ox. Then to prevent the skin wearing out so quickly wooden skids were fixed underneath. Still later a roller, suggested by a fallen tree, led to the invention of the wheeled vehicle—though the wheeled vehicle was unknown in America until it was introduced by Europeans. Somewhat in this way, therefore, our nomadic or " wandering " ancestors came to devise means of transport by the necessity of moving about their flocks and herds.

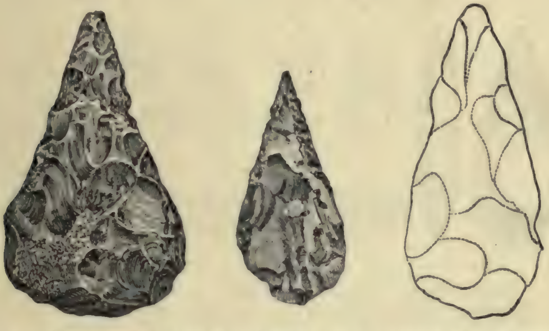

FIG. 1.—EARLY STONE AGE FLINT PICKS OR HATCHETS (PALAEOLITHIC). (Tylor.)

Division of Labour. While everyone took a hand in the work of the tribe, the making of weapons, tools, clothing, tents and other necessaries gave rise to a certain division of labour. Perhaps the first separate trade was that of a butcher, because one man possessed a sharper flint knife than the others and was especially skilful in finding the joints of a wild boar. If a man broke his leg and had to lie up for a time, or had been weak from birth, or had an illness so that he was unable to follow the chase, he might spend his time in sedentary occupations, such as making bows and arrows, fishing tackle or clothing. And though it had been the general practice for each man to make these things for himself, the one who spent more time upon craftsmanship than upon hunting or fishing would acquire greater dexterity and skill. The others would say to him, "You make our tools or weapons or clothing and we will provide you with food and drink." And he would not only do what they asked but, like the famous hunter and fisherman, he would take a greater pride in his own skill because it was appreciated by others as well as himself. He found what many people do not realise to-day, that there is a greater social value in self-esteem, or even, if you like, proper vanity, than selfishness. Work for others, however menial it may be, bears the hall-mark of nobility.

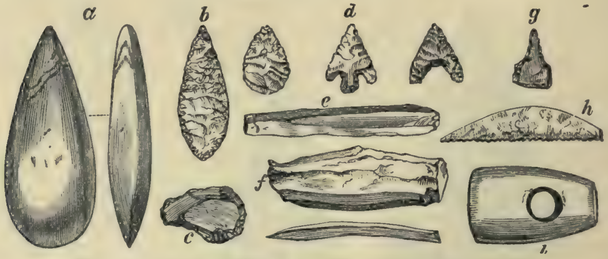

FIG. 2.—LATER STONE AGE (NEOLITHIC), IMPLEMENTS.

a. Stone hatchet. *b.* Flint Spear-head. *c.* Scraper. *d.* Arrow-heads. *e.* Flint flake-knives. *f.* Core from which flint-flakes have been taken off. *g.* Flint-awl. *h.* Flint-saw. *i.* Stone hammer-head. (Tylor.)

The Agricultural Stage. But men were not merely flesh and fish eaters, so that the products of hunting and fishing did not completely satisfy their needs. Originally dependant upon the natural product of forest and field for fruits and vegetables, they observed that the plants which produced roots or fruits or stems or leaves which they liked, and which they found by experience to be good for them, grew in places widely apart and were choked by the plants around them. Useless plants were, therefore, pulled up to give the favourites room to develop, and a new secret was revealed. Men saw new plants increased by seed, noted the time when the seed fell to the earth and the season when new growth began, and henceforth grew food plants in prepared ground. A new occupation—that of agriculture—was open to them.

But in general they had to make a choice. The need of the animals for fresh pasture rendered movement necessary: the long period between sowing the seed and reaping the harvest, apart from the labour of clearing and preparing the ground, rendered settlement in one place essential. So that, on the whole, some men entered the agricultural while others remained in the pastoral stage.

The Settlers. The settlers chose naturally some of the most fertile regions of the earth, such as the valleys of the Tigris and Euphrates, and the narrow rock-bounded valley of the Nile. Here man began first to measure his strength against the forces of Nature. When, in Babylonia, Nature sent the flood to destroy his crops, his villages and his temples, he built the latter upon mounds and flung earthen embankments alongside the rivers to keep them from overflowing the land. When again, in Egypt, Nature held back her waters, so that the flood was lower than usual, he cut canals to convey the water to his fields, and devised ingenious means of raising water from wells.

Thus secure from flood or drought the earth yielded rich harvests, abundant food was produced with relatively little labour, and men had leisure to learn still more of Nature's ways, to acquire new arts and to think out the systems of government which characterised the nations of old.

The Nomads. Meanwhile the nomads pursued their wandering life. They learnt little with the passing years, despised the comforts enjoyed by men living in great cities, and took greater pride in the health and strength and vigour with which their free open-air life endowed them. When Nature threatened, as she not infrequently did, they bowed their heads to her will, struck their tents, and set out in search of land where their mistress was in kinder mood.

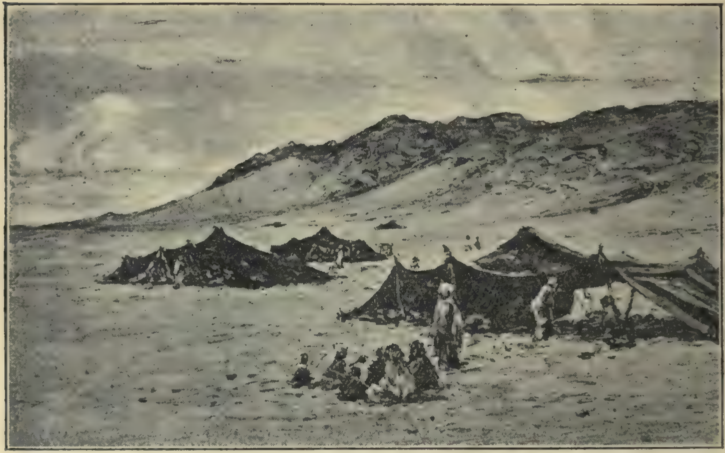

FIG. 3.—ARAB ENCAMPMENT.

The Migrations of Peoples. Let us examine this a little more closely. The cradle of the human race was the table-land of Central Asia, and from the earliest times to which History extends there were vast movements of men westwards and southwards. These movements were generally war-like in character: they were not always merely raids undertaken for the purpose of plunder, but were often carried out by vast hordes intent upon founding new homes, and ready to win them by the sword.

At first the rich and prosperous nations of Babylon and Egypt were the goal; Babylon fell before the invader, and for long years Egypt was ruled by the Hyksos or Shepherd Kings, who were possibly Hittites from Asia Minor. The Greek Nation was the result of an invasion in which the ancient population of Greece and the neighbouring islands was almost utterly destroyed. Later the movement turned westward, Rome was sacked by Alaric the Goth, and the right wing of the advancing army reached and crossed the Rhine.

There are geographical reasons for believing that the Central Asian plateau has for centuries been growing drier. This change would not be gradual, but would be manifested by more frequent dry years, when men and beasts would suffer from lack of water. And it seems possible that these migrations of people were caused by climatic changes which were the more serious as the population grew larger. But whatever the cause, they were important for us, because our ancestors were the nomad tribes who had made new homes for themselves in the valleys of the Elbe and the Weser, the Ems and the Rhine. Whether they were dissatisfied with the country they had won and sought a better, or whether they were driven forward by other waves of humanity behind them, matters not. From the fifth century onwards they poured across the narrow seas, drove the original Celtic inhabitants northwards and westwards before them, and were here when the ordinary history books begin.

QUESTIONS AND EXERCISES ON CHAPTER I.

1. Look up, in any books which are available to you, the various methods by which primitive tribes to-day produce fire.

2. Give a short list of the earliest arts practised by man. Check these by reference to some work of reference in the School, or Public Library.

3. Can you suggest any reason for the permanence of the Egyptian records ?

4. Write a short account of the way in which "specialisation" of handicraft might arise.

PART I

THE MIDDLE AGES

FROM THE NORMAN CONQUEST TO 1500

TIME CHART OF THE MIDDLE AGES.

Kings of England.	Social and Political Events.
1050	
William I. 1066.	
William II. 1087.	Doomsday Book. 1086
1100	
Henry I. 1100.	
Stephen. 1135.	
1150	Towns active in securing charters. Gild merchant. About 1150.
Henry II. 1154.	
Richard I. 1189.	
1200 John. 1199.	Magna Carta. 1215.
Henry III. 1216.	
1250	Craft-gilds becomes common. About 1250.
Edward I. 1272.	
	Model Parliament. 1296.
1300	
Edward II. 1307.	
Edward III. 1327.	
	Beginning of Hundred Years' War. 1338.
	Black Death. 1348.

TIME CHART OF THE MIDDLE AGES—*continued.*

	Kings of England.	Social and Political Events.
1350		First Statute of Labourers. 1351.
	Richard II. 1377.	
		Peasants' Revolt. First Navigation Act. 1381.
1400	Henry IV. 1399.	
	Henry V. 1413.	
	Henry VI. 1422.	
		Invention of Printing. 1445.
1450		Sack of Constantinople. 1453. Wars of Roses began. 1455. End of Hundred Years' War. 1451.
	Edward IV. 1461.	Caxton introduced printing into England, 1477.
	Edward V. 1483.	
	Henry VII. 1485.	
1500		

CHAPTER II

THE MANORIAL SYSTEM

An old English Village. A typical English village at the time of the Norman Conquest would consist of a cluster of houses, from ten to fifty or more in number, arranged round a village green or lining the roads which passed through or across a valley. At a little distance lay the Manor House, inhabited by the Lord of the Manor, and near by was a church. The surrounding land was partly cultivated, partly meadow, and partly pasture, the latter stretching outwards to the verge of the primitive forests which still covered a large part of the country.

The Lord of the Manor was generally a great noble, a bishop, abbot, or even the King, and where the owner did not reside permanently on his estate he employed a steward or bailiff to manage it for him. The Manor House in which he or his steward lived was sometimes a castle, sometimes merely rather a better dwelling than these in which the villagers abode.

Method of Farming. The arable or cultivated land was divided into three fields, two of which were sown each year while the third lay fallow, or idle. Long experience had taught our forefathers that land became less fruitful year by year if it was cropped continually, and that it recovered its fertility by rest Moreover, they had learnt that a certain succession of crops gave the best results, so they grew wheat or rye one year, oats or barley the next, and nothing in the third, though cattle might graze on the herbage which sprang up during the summer. Why a year of rest helped to restore fertility, why a certain order of crops was an advantage, and why the grazing of animals should be beneficial, was left for nineteenth century Science to discover and explain.

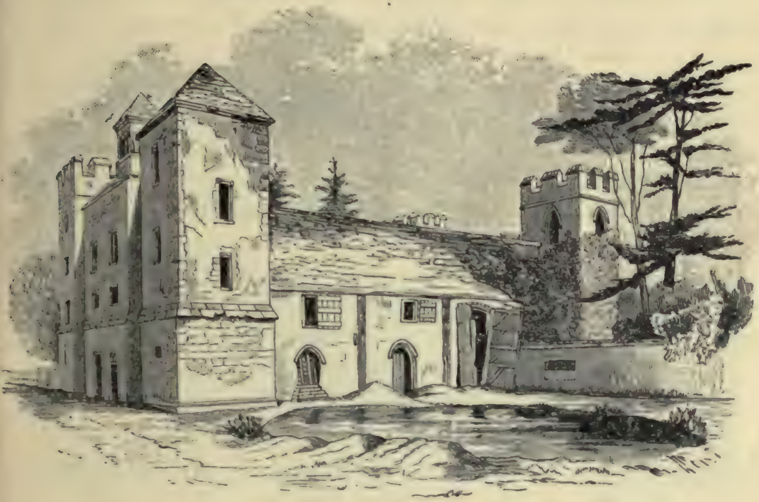

FIG. 4.—MANOR HOUSE, ACTON BURNELL, 1283-1292.

Instead of closed fields surrounded by hedges and ditches, the cultivated land consisted of "open" fields divided into strips forty rods long (a rod was generally about sixteen and a half feet) and one, two, three or four rods wide. The largest strip was an acre, and its length "one furrow long" is the origin of the furlong in English measures. Some of the strips belonged to the lord and were known as Demesne Land, and the rest to the villagers; but in order that there should be no advantage in soil or situation no man had two strips together.

The Villagers. The villagers lived under the protection of the Lord of the Manor, to whom they made payments in money or the produce of the land they cultivated, and to whom they rendered service. They had to cultivate his land as well as their own. Thus a *free tenant*, of which there were not at first a large number, tilled a virgate (thirty acres) or more of land, was liable for payment in money or kind, and sometimes had to give service at certain seasons, such as seed time and harvest. This was called *boon* service. The *villeins* or customary tenants held usually a virgate of land, had to make payments in money or kind, were obliged to work for their lord on two, three, or four days a week throughout the year, and to render boon service in addition. The *bordars* and *cottars* held from one to five acres, and often gave one day a week to the lord's service. For the rest, the tenants helped one another in ploughing, sowing and harvesting, and everyone had the right to use the common pasture for such animals as he possessed.

The villeins, bordars and cottars were little better than slaves They had to make a variety of payments in addition to rendering services; they could not leave the Manor without permission, and even then a periodical payment had to be made; they were outside the common law and could seek justice only in the Manorial Court, over which the Lord of the Manor presided; and even the free tenants were not at liberty to leave the Manor or to sell their land without permission.

But it does not follow that they were treated unjustly or were necessarily unhappy. The life was hard and monotonous, but it was a hardness and monotony which freeman and serf alike shared. Food was coarse and unpalatable, but it was cheap and there was plenty of it. Life in the medieval Manor was in fact dominated by custom and, generally, custom seems to have been observed on both sides. Until the middle of the fourteenth century people were on the whole contented, if for no other reason than that ideas and conduct had become fixed habits, and there was no better state of existence in view.

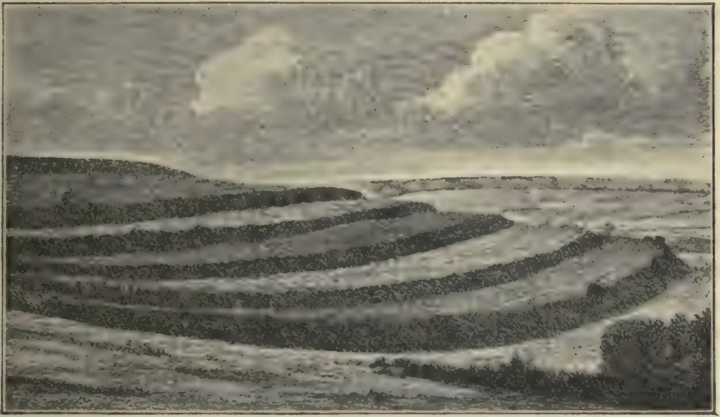

FIG. 5.—"LINCHES" IN THE OPEN FIELDS OF CLOTHALL, HERTS.
(From *English Village Community*, by Frederic Seebohm, 1884.)

Manorial Customs begin to change. Nevertheless, changes were occurring. During the thirteenth and fourteenth centuries the free tenants increased in numbers, very frequently securing their freedom by paying a *quit-rent* in lieu of services.

This method was encouraged by the growing use of money. Originally every village was a small, independent community, producing all that it required for its own needs. The primary necessities were food, clothing, houses, and fuel, and so long as these were obtainable men wanted for nothing more The lord provided them with land and houses—wretched one-roomed shanties, to be sure, but still affording some protection against the weather; food they got by their own labour from the land; fuel from the neighbouring woods; and clothing they made from untanned skins. The miller ground their corn, and the smith made their tools in exchange for a measure of corn or a fowl or something else of which he himself had need.

Men had in those days no incentive to acquire wealth. They desired only to live. The things which they needed were perishable or wanted for immediate and regular use. And so long as one thing could be exchanged for another, money was not required. The time would come, of course, when exchange was not so easy. A man who made nothing but hats would find it difficult to procure meat from a butcher who required only boots. But that time had not yet arrived. Money was not, however, unknown. It had been introduced by the Romans a thousand years before, and in fact the value of a thing was sometimes expressed in money though no money passed when the bargain was made.

The system was altered mainly as a result of the French Wars of the later Plantagenets, who found money the best means of payment to their soldiers. This encouraged the use of money in civil life; some villeins purchased their freedom; the hiring of agricultural labour became common; and many cottars began to work for a weekly wage rather than cultivate land for themselves.

Moreover, the need of money to pay the soldiers led to new taxes being imposed, and these had to be paid in coin of the realm. But before this change took place a great disaster occurred which destroyed the customs of the Manor and effected a revolution in the process of Agriculture which had remained practically unaltered for more than three hundred years.

Questions and Exercises on Chapter II.

1. Name any manor houses in your own district. Are they really medieval manors ?

2. Write down the crop sown last year and the crop sown this in any field you know.

3. Why were a man's "cultivated" strips distributed instead of being close together ? What was the motive for this practice ?

6. What different grades of tenants lived on the medieval Manor ?

5. What services were rendered by the tenants to the lord of the Manor.

4. Write a short essay on the changes that occurred in village life during the thirteenth and fourteenth centuries ? (Before the Black Death).

CHAPTER III

THE BLACK DEATH AND ITS RESULTS

THE Middle Ages was a period of pestilence ; from time to time terrible diseases broke out and swept across narrow seas and over thousands of miles of land. Arising usually in some crowded centre of population in the East they spread with fearful rapidity, along the trade routes, westwards and northwards until the broad stretches of the Atlantic barred their further progress. And of all these visitations the most important in its ultimate consequences was *The Black Death*, which reached England in 1348.

Ravages of the Great Pestilence. The term Black Death is not the name by which it was known at the time. Men called it then *The Great Death*, *The Great Mortality*, or *The Great Pestilence* ; and there are reasons for believing that it was a particularly severe outbreak of the Bubonic Plague, well known and justly feared in Eastern countries to-day. A person who contracts the disease is dead or on the way to recovery within three days ; and six hundred years ago, when people lived under wretchedly dirty and insanitary conditions and modern medicine was not yet born, most people who had it died. Plague or no plague, the annual death rate was high—perhaps as high as fifty per cent. ; but in 1348-9 it has been estimated that from one-third to one-half of the population disappeared.

The number of people had risen since the Norman Conquest from two millions to four, and they fell suddenly to about two and a half. In such a visitation rich and poor, high and low, strong and weak, suffered, but the general result would be to leave the strong in greater proportion and to raise the physical standard of the race. The fittest survived.

FIG. 6.—GROUP IN A MANOR HOUSE, A.D. 1338-1344.
(MS. *Bodl. Misc.* 264.)

Effect of the Pestilence on the Manorial System. Such a wholesale destruction of human life could not occur without affecting seriously human relations. The organization of the Manor had been built up through at least 300 years. There was work for practically everyone, and each had his place in the scheme of things. Every operation of agriculture ; the work of the miller, the smith, the occasional tanner and weaver ; the management of the estate, the administration of the law—for all these there were, before the Black Death, men accustomed to and willing to undertake the work.

But when in a single year half of these were gone, when whole families had disappeared in some cases and only young children left in others, the work of the Manor was thrown into confusion. In some respects the lord benefited. The payments which had to be made to him when a tenant died, when a new tenant took up land, and the profits from the land which fell into the lord's possession when a free tenant died leaving no heir, were increased. On the other hand, the regular payments in money and kind were less because there were fewer people to pay them ; the profits from the Manor Court were less because there were fewer suitors ; lastly, and most important, the amount of agricultural labour obtainable for hire had greatly diminished.

Now the price of a thing varies with the anxiety to purchase and the willingness to sell. If a thing is in great demand, the scarcer it is the dearer it becomes. And because labour on the land was much needed and extremely scarce the labourers, who belonged mainly to the old cottars, demanded higher wages. If the lord refused they moved to another Manor where better terms could be obtained. But this movement was directly opposed to the custom of several hundred years' growth, by which the man was bound to the soil. So in order to prevent it, and to force labourers to accept the terms offered on their own Manor, Parliament passed between 1351 and

1444 a series of fourteen Acts called the *Statutes of Labourers.*

Peasants' Revolt. The organization of the Manor, however, was so shattered by the decrease in population that attempts to re-establish it by Acts of Parliament were futile. Instead of the desired effect the earlier Acts led to the *Peasants' Revolt* in 1381. For this revolt, however, there were three principal causes. First, the cost of living had greatly increased because of the difficulty of cultivating the land with the labour available; the demand for higher wages was consequently justified; and there was widespread discontent at the efforts made by the governing classes to maintain the old order. Secondly, there was a religious revival under the Lollards which indicated a spirit of independence markedly different from that of the previous century, and some preachers, notably John Ball, who was not a Lollard, openly advocated rebellion. Thirdly, and perhaps most important, the poll taxes imposed in 1377, 1379, and 1380 were regarded as a new form of tyranny and oppression.

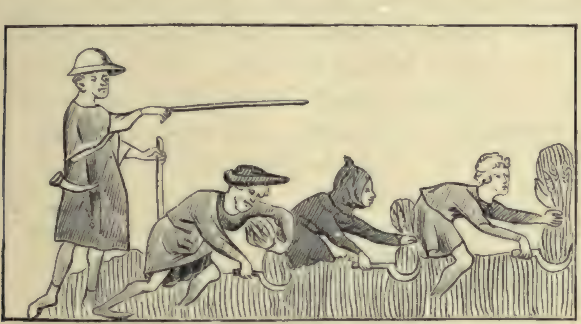

FIG. 7.—REAPERS AND HARVESTMEN. EARLY FOURTEENTH CENTURY. (MS. *Roy.* 2 B. vii.)

The trouble rose in Essex in May of 1381, and in other parts of England in June. How it was broken is told in every school History of England and need not be repeated here. Though the revolt did not secure what its authors desired immediately, it did increase considerably the rate of abolition of serfdom. *Commutation of Services,* by which is meant the payment of a sum of money instead of rendering service, went on more rapidly. Men who could do better on their own land than in working for the lord of the Manor purchased their freedom, while others offered themselves wholly for hire. This was more convenient on both sides, and it was rendered possible by the increasing use of money; and at first by the great scarcity of labour. For though after the Black Death a man would not be bound to the soil by law and custom he was not unwilling to be bound by wages, if they were on a sufficiently liberal scale.

Enclosures and rise of Sheep Farming. But a much more important change took place in the methods of agriculture. With high wages and a scarcity of labour the old methods became unprofitable. So long as the fields were open and tilled in common every man had to farm his piece of land in the same way; and so long as the pasture was common pasture the breed of domestic animals could not be improved. There were, however, many cases in which the demesne had been enclosed, and the lord had been empowered even as early as 1235, by the *Statute of Merton,* to enclose a portion of the pasturage, leaving only sufficient for the common needs of the villagers. As to what was sufficient he often appears to have been the sole judge.

A further incentive to effect such enclosures arose from the fact that English wool was rapidly improving in quality, having the reputation of being the finest in Europe, and commanding high prices in the markets of Flanders. Not only was sheep farming profitable, but it required less labour than ploughing, sowing, and harvesting crops from arable land. The desire to get rich, or, at any rate, to get not less than before, was strong; enclosures were enforced by Acts of Parliament; and injustice or hardship were not allowed to stand in the way. Before 1550 nearly half the land had been enclosed. If a freeman could not prove his title he had to go, so that his strips might be collected and in some cases converted to pasture; and the enclosure of the common pasturage deprived others of a part of their living and drove them to the ranks of labourers plying for hire, or, since fewer labourers were required, to eke out a living of some sort in the towns.

The prosperity of the wool trade and the need of money for carrying on the French War led *Edward I.* to encourage foreign trade as a source of revenue. He imposed an export duty on wool and hides, and thus founded the *Customs.* In order to collect the taxes it was necessary that sales should take place only in certain markets which the King's Officers could attend, and even then only through certain merchants called *Merchants of the Staple.* They were the first considerable body of traders, as distinct from farmers and craftsmen in England, and they were men, not of the manorial village, but of the town. We have seen generally what was going on in the country up to about 1550, and it will be profitable to consider now another aspect of English life and labour during the same period.

QUESTIONS AND EXERCISES ON CHAPTER III.

1. What was the Black Death? When did it occur? How did it affect wages and why?

2. What changes in the methods of Agriculture began in the fourteenth century?

3. Explain in a few words the following: "Peasants' Revolt," "Commutation of Services," "Enclosure," "Merchants of the Staple."

CHAPTER IV

THE TOWNS AND THEIR GILDS

Origin of Towns. With the exception of London and a few other places which had been Roman military centres, the towns of medieval England grew out of the manorial villages. Some of them, like Bristol, owed their importance to the fact that they were situated at the mouth of a river which attracted traders from foreign lands. The population tended also to cluster at cross-roads or a ford or a bridge, near a sacred place where pilgrims came to worship, or beneath the shadow of a baronial castle the owner of which could guarantee law and order in the surrounding district.

Markets. The first difference, perhaps, between the village and the town lay in the establishment of a market to which people from the neighbouring manor or manors came to exchange their surplus produce. This practice of exchanging goods in a market would result in the skilled craftsmen—especially smiths, carpenters, tanners, and so on, congregating in the towns to which their customers would come or in which their customers lived. For the population of the town would be larger than the village, and though the townsmen would still cultivate the surrounding fields and graze their cattle and sheep on the neighbouring waste, there would be an increasing proportion of them who did not depend wholly upon their work on the land for a living.

Now, since the spirit of the early Middle Ages was all in favour of fair dealing, rules had to be made to regulate buying and selling. These rules were drawn up by the lord of the Manor, and in order that they might not be disobeyed, it was common even in Anglo Saxon times to require all transactions above a certain value to be carried out in the market and in the presence of witnesses. The organization of the market demanded tolls for its upkeep, and the income from this source was increased by fines for disobedience of the rules. It was thus a source of profit to the lord.

Movement to secure Charters. In the twelfth century a movement arose in which the townspeople sought to secure control of both the town and the market for themselves. Sometimes they were actuated by a desire to be free from what they felt was the unfair control under which they worked, but there was always the very natural desire, which most people have, to manage things in their own way.

If the town was under a single owner, be he king, bishop, abbot, or noble, there was not as a rule much difficulty in securing a Charter. It was mainly a question of what sum the town was prepared to pay. But when, as sometimes occurred, part belonged to one man and part to another, there was considerable trouble and years of delay. By the middle of the thirteenth century, however, there were about two hundred chartered towns, most of them containing from 1500 to 4000 inhabitants. London had, perhaps, a population of 25,000, and Bristol and York, two of the largest provincial towns, about 10,000 each.

Gild-merchant. While the town itself was managed by the *Mayor*, *Aldermen, and Burgesses*, the management of the Market was in the hands, at first, of the *gild-merchant*. This was an association of all persons who wished to trade in any commodity except food. The object of the gild was to carry out the great moral principle of fair-dealing by regulating the price and quality of goods bought and sold in the town. Trading was required to be carried on in the open, where all could see; and to secure effective oversight, those who practised the same craft were often required to live in the same streets, which not infrequently took their names from the occupations of those who dwelt therein.

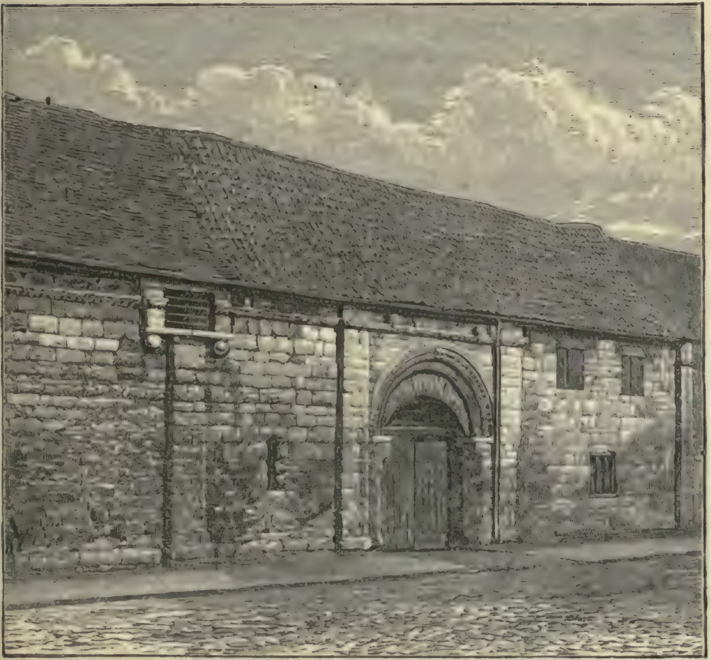

FIG. 8.—HALL OF ST. MARY'S GILD, LINCOLN. TWELFTH CENTURY.
The Hall of one of the many gilds which had a charitable or religious object.

Membership was usually confined to burgesses, and an entrance fee was charged. Only members of the gild were allowed to trade, though, in special circumstances the privileges were accorded to traders from other towns who were usually regarded as "foreigners," just as much as though they were French or German or Italian. For this privilege, however, heavy tolls were charged, so that the stranger could not undersell the local trader; he had also to do his business and leave within forty days, and in order that he should not keep up the price by holding back goods, he had to sell everything he had brought with him. The consequence was that the "foreigner" had no chance with the ordinary necessaries of life which every town could provide for itself, and he could as a rule only trade successfully in luxuries which wealthier people could afford to buy.

In order to maintain the quality of goods produced in the town every candidate for admission to the gild had to produce evidence of his training. Every craftsman had, therefore, to have served an apprenticeship, and as apprentices could not produce work of the quality of the adult workman, the number of apprentices which any man could take was strictly limited. For the same purpose the trades were highly subdivided. The capper made caps, not clothes; the cobbler stuck to his last, and merely mended shoes, while the shoemaker only made them; one smith shoed horses, another forged ploughshares, and another made nails, and so on. Further, as work done by the poor artificial light then available was never so good as that done in daylight, night work was usually prohibited.

In addition to controlling price and quality the gild was a real mutual benefit society. If a member fell ill he received help, and if he died provision was made for his widow and family.[1]

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[1] The object of many gilds was, or ultimately became, charitable or religious.

The foregoing statements represent the aim of the gilds rather than their actual achievement. The practice varied in different towns and the methods were effective in varying degrees. The evidence which has come down to us is too fragmentary to justify positive statements of general application. It is certain, however, that it was an organization primarily for the regulation of trade, distinct from the organization for the management of town affairs generally, but containing the most prominent townsmen among its members.

Craft-gilds. Now the gild-merchant served its purpose only so long as the town remained small and the number of craftsmen few. But as the town grew so also the number of craftsmen increased. Moreover, many apprentices were either unable or unwilling to become masters, and a class of journeyman, working for a weekly wage, arose. About 1250, therefore, separate *craft-gilds* began to be formed with precisely the same objects as the gild-merchant. There was a group of them concerned with the making of clothing, another composed of various workers in metals, a third comprising workers in wood, a fourth workers in leather, and so on; and in the fourteenth century these became both numerous and powerful.

Decline of the Gilds. As the craft-gilds arose the gilds merchant declined, and the power appeared to have passed smoothly from one to the other. In both organizations there was no distinction between Merchant and Trader—the man who bought and sold what he did not produce was rare. And in the craft-gilds there was probably at first no distinction between master and journeyman.

Causes: Exclusiveness. But they gradually became more and more exclusive, and it became more and more difficult for a man to gain admission and thus acquire the right to practice the craft to which he had served an apprenticeship.

For this there were several reasons. The gild system tended to isolate each town in the same way that the customs of the Manor tended to isolate each village. It tended to make them independent of one another. Further than that, it induced a certain rivalry, so that each town desired, not necessarily to become wealthy, but to become wealthier than its neighbour. This is shewn by the restrictions on inter-town trade.

Growth of Foreign Trade. Again, *Edward I.* and *Edward III.* had a definite national policy which was opposed to the parochial policy of the towns. Partly in pursuit of this, and partly to raise money they encouraged foreign trade and the more general use of the coinage. The members of the gilds saw that by restricting their numbers and keeping the authorised trade of the town in the fewest possible hands they might acquire wealth. The foreign trade was increasing the number of desirable things, it was raising the standard of comfort, and men wished to be able to purchase whatever caught their fancy or contributed to the amenities of life.

The first people to be excluded from the gilds were certain foreign workmen—chiefly Flemish weavers—who had been encouraged to settle in England by the two Edwards, but the practice grew until it was difficult, if not impossible, for a journeyman to gain admission at all. The restrictions were greater in some towns than others, and both foreign and English workmen settled in those places where there was greater freedom. The avarice of the gilds proved their undoing; from the fourteenth century they gradually declined; and by the end of the seventeenth had practically disappeared. The only survivals are the Gild-Merchant of Preston, which has none of its old powers, and the Livery Companies of London, which are the old craft-gilds with greatly altered characters and functions. The capital never had a Gild-Merchant. It was probably too large when the movement arose.

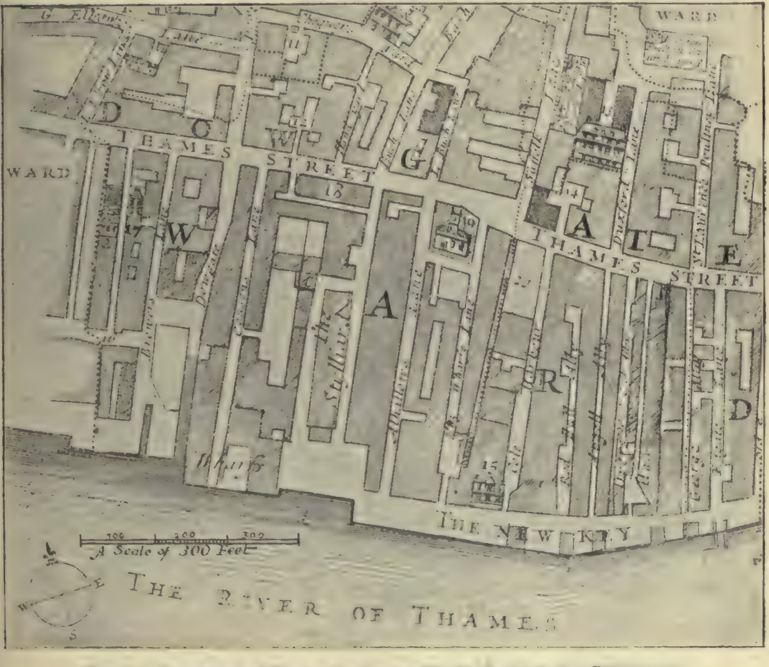

FIG. 9.—PART OF THE MAP OF DOWGATE WARD SHOWING THE STYLLIARD OR "STEELYARD."
(From Stowe's *London*, book ii. vol. i.)

Immigration of Foreign Workmen. Apart from the gilds the most important industrial change was that which resulted from the introduction of foreign workmen. It was described in the Introduction how the English Nation was mainly the result of settlement of nomad tribes who had probably come originally from Central Asia, and that skill in handicraft came only after long years of settlement. The most skilful workmanship of the ancient world arose in the East where the first settlements were made. This skilful workmanship reached Europe from India, China, Persia through the Arabs, who, about 800 A.D., spread across Northern Africa and settled in Spain. From Spain, knowledge of materials, quickness of eye, and dexterity of hand filtered slowly across the Continent to the barrier of the Ural Mountains, across which it can scarcely be said to have passed to-day.

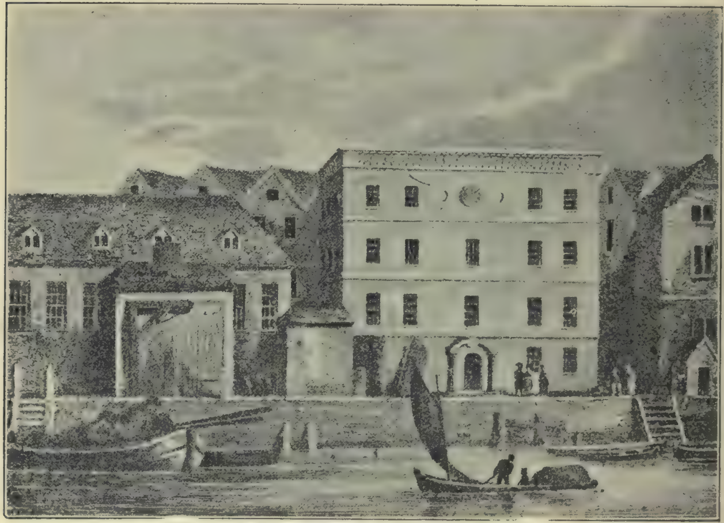

FIG. 10.—THE STEELYARD, THAMES STREET.
From a Contemporary Print.

The people of England were introduced to the product of highly skilled foreign workmen by foreign merchants who visited the country for trade. They brought with them fine cloths, linens, cambrics, and tapestries from Flanders; armour, weapons, glass-ware, and furniture from Holland and Denmark; and many other things, but more especially iron and steel goods from the towns of Northern Germany. The towns from which these goods came had working agreements whereby they were represented by bodies of the Merchants of their own nationality, such as the Flemish House of London and the German Hanse League, which was the most important, and had its headquartres in the Steelyard, London, on the site of Cannon Street Station. There were also French merchants who brought chiefly wine from Gascony and Burgundy. They took back with them wool, hides, tin, and lead.

The foreigners were never popular, and traded at first under great disabilities. But as early as 1303 Edward I. guaranteed them security and exemption from certain tolls, a practice which was, on the whole, followed by his successors.

Edward III., however, deliberately encouraged Flemish weavers and other craftsmen to settle in order to develop English industries. Finding the restrictions of the gilds too strong for them, many of these men settled in the villages, and from them the English learnt especially the arts of spinning and weaving. It was not long before English cloth rivalled that from Flanders, and the home demand for wool increased, fortunately at a time when competition with wool from other countries became keener.

The Commission System of Industry. The weaving industry now took on a new form. A class of merchants had been gradually growing up and now became more numerous. They bought raw wool and handed it out to be spun for an agreed price. Then they handed it out to the weaver to be made into cloth, which they sold locally or in foreign markets. This is sometimes called the *domestic* system of industry because it was carried out in the homes of the people, and sometimes the *commission system* because the work was simply done "to order," or "on commission." The main difference lay in the fact that the merchant and not the workmen owned the raw material. This system constituted a further blow to the authority of the gilds, because it was carried on for the most part in country districts, often in addition to cultivation of the land, and beyond the reach of the gild organization.

QUESTIONS AND EXERCISES ON CHAPTER IV.

1. Explain why any one of the towns of the Middle Ages (excluding London) acquired its importance.

2. What do you understand by a market ? Why was a market important in the Middle Ages ?

3. Describe the work of the Gild-Merchant.

4. What, should you say, were the five most important trades of a medieval town ?

5. What were the craft-gilds ? When did they arise ?

6. Give reasons for the decline of the gilds.

7. What were :
    (*a*) The chief exports,
    (*b*) The chief imports,
during the fifteenth century ?

PART II

THE AGE OF ADVENTURE

FROM 1500 TO 1700

TIME CHART OF THE AGE OF ADVENTURE.

Kings and Queens of England.	Social and Political Events.	Voyages, etc.
1450		Vasco da Gama sailed round C. of Good Hope. 1487.
		Columbus re-discovered America. 1492.
		John Cabot, 1st voyage to N. America. 1496.
Henry VII. 1485.		John Cabot, 2nd voyage to N. America. 1498.
1500 Henry VIII. 1509.		
	Suppression of Monasteries. 1535.	
1550	Privileges of Hanseatic League withdrawn. 1551.	Muscovy Company. 1553.
Mary. 1558. Elizabeth. 1558.		Drake's Voyage round the World. 1577-80.
	Statute of Apprentices. 1563.	First Colony in Virginia. 1585.
	Defeat of Armada. 1586.	Levant Company. 1581.
	Invention of Stocking Frame. 1589.	

TIME CHART OF THE AGE OF ADVENTURE—*continued.*

	Kings and Queens of England.	Social and Political Events.	Voyages, etc.
1600	James I. 1603.	Poor Law. 1601.	East India Company. 1600. Settlement of Virginia. 1610.
	Charles I. 1625. Cromwell. 1649.	Civil War begins. 1645.	
1650	Charles II. 1660.	Navigation Acts. 1651.	First Dutch War. 1652-4. Conquest of Jamaica. 1655.
	James II. 1685. William and Mary. 1689.		
1700			

CHAPTER V

THE WIDER OUTLOOK

We have seen how, in the five hundred years after the Norman Conquest, great changes took place both in the methods and in the organization of rural life, and how the gild system in the towns rose and decayed. We have seen, too, how these changes had been speeded-up or delayed by the action of the King and the Parliament. During the next two hundred years—roughly from 1500 to 1700—the influence of the Government became of even greater importance, and this influence was re-enforced by two other movements which were not confined to England.

The Revival of Learning. The first of these movements was the *Revival of Learning*, which, by a fortunate accident, occurred at the same time as the *Invention of Printing.* The vast stores of knowledge which had been acquired by the great nations of old were, for the most part, locked up in Greek manuscripts, and the scholars who owned them lived in Constantinople. The Roman Empire, which succeeded that of Ancient Greece, stretched from Italy to Asia Minor, but in the fourth century it was separated into halves as the result of a quarrel known as the *Great Schism.* So long as this quarrel lasted, Western Europe had to be satisfied mainly with the fragments of learning which came to it through the Arabs who had settled in Southern Spain.

But early in the fifteenth century fresh hordes from Central Asia began to threaten the Eastern half of the Roman Empire. Timid scholars who feared for their lives, or their precious manuscripts, fled to Rome for greater safety; and when finally the Ottoman Turks sacked Constantinople in 1453, there was a wild stampede which again enriched the Western World with the literary treasures of the East.

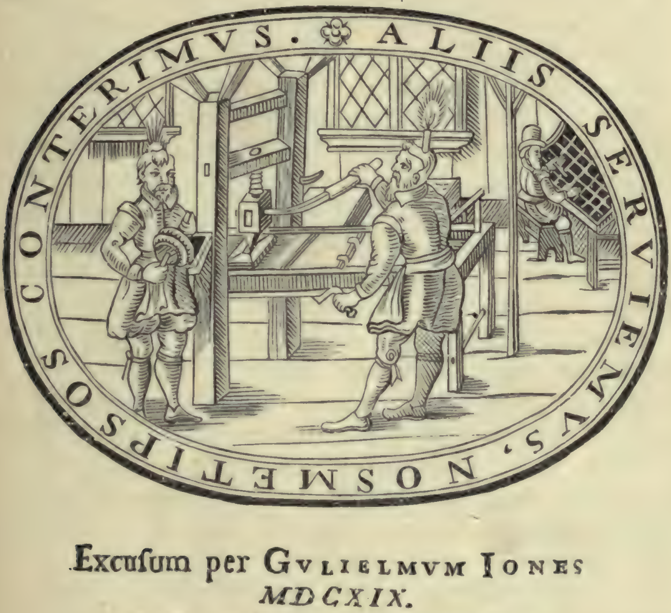
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FIG. 11.—AN ENGLISH PRINTING OFFICE. 1619.

Invention of the Printing Press. Up to 1445 the only method of reproducing books was the tedious process of copying them by hand. A system of printing by blocks had been invented by the Chinese, but it was not suitable for European writing. Had it not been for Gutenberg's invention of the printing press, books could never have been plentiful or cheap. Once, however, that came into use, the stored-up knowledge and the wise thoughts of men of past ages were open to all who could read. The minds of men were widened and stimulated, and they faced the problems of life with freshened outlook and renewed vigour. The revival of learning affected mainly—so far as history is concerned—Politics and Religion. In Politics it led to more definite views which were effectively carried out, and in Religion it gave rise to a strong movement against the Catholic Church. The Reformation, by cutting off England from the Church of Rome, strengthened the hands of the Tudor Kings in seeking to make the country not merely prosperous but wealthy and powerful.

Voyages of Discovery and Exploration. The second movement was the great *Maritime Expansion* both in respect of trade and in voyages of exploration and discovery. The first great navigators were the Portuguese. In 1487, *Vasco da Gama* sailed round the Cape of Good Hope, and eleven years later a fellow-countryman reached India by the same route. Meanwhile, in 1492, *Christopher Columbus* re-discovered America having, as we know to-day, been anticipated by the Danes many years before.

Rise of English Shipbuilding. At first England had no share in this movement. During the Middle Ages she had practically no ships, and overseas trade was carried on entirely in foreign vessels. But in the reign of Edward III. English *Merchant Adventurers* began to make voyages in their own ships. The Plantagenet Kings had, in fact, done something to provide a navy for policing the Channel, and both Henry VII. and Henry VIII. were even more enterprising in this respect. It was not, however, until the reign of Elizabeth that the shipbuilding industry became of real importance.

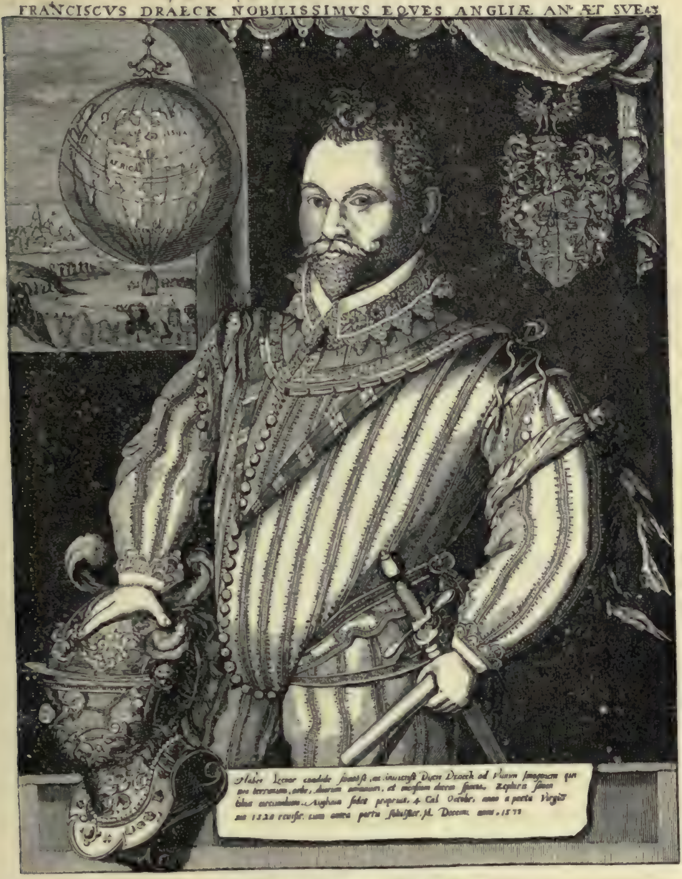
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FIG. 12.—SIR FRANCIS DRAKE.

Drake Sails round the World. By that time the Devon seamen were at the height of their fame, and challenged the Portuguese and Spaniards wherever they met them. In 1577-80 *Drake* sailed round the world, and about the same time Elizabeth contributed to the expenses of the *Muscovy Company*—one of those associations of Merchants like the *Levant Company* and the *East India Company*, which had succeeded the Merchant Adventurers. The older companies were bodies of merchants who combined for the purpose of securing privileges or concessions; the newer were Joint-Stock Companies which traded as a whole, each sharing profits according to the amount of his contribution.

There were three fairly distinct stages in this expansion. The earlier voyages—those of the fifteenth century—were almost purely voyages of discovery. Men went and looked, and came away again, bringing with them whatever took their fancy that they could secure. These voyages of discovery were combined during the sixteenth century with privateering—which is only a polite name for piracy. For this the English were not altogether responsible. In 1494 the Pope divided the New World by a line of longitude, giving the east of that line to the Spanish and the west to the Portuguese. No English ship, therefore, was safe from attack, and they could hardly be blamed for defending themselves, or even for preparing to meet what they were sure would come. How they triumphed has been celebrated in song and story, and having established their supremacy they entered upon a century of trade and settlement. The seventeenth century witnessed the birth of the first permanent Colonies.

Effect of wider outlook. This sudden enlargement of the world was as wonderful as the enlargement of knowledge which accompanied the revival of learning. It was as though men had been living in a small narrow valley with the view beyond the hills obscured by clouds. What lay on the other side could only, dimly and vaguely, be imagined. Rapidly and almost without warning the hills melted away and the clouds dissolved. The world was bigger, immensely bigger, than before. It stretched far into the purple distance, and beckoned those who had courage and enterprise to probe its secrets and explore its wonders.

The result both of the revival of learning and the maritime expansion was to create a spirit of restlessness, of enquiry. Men not only sought new lands, but new methods of living, new types of government, new forms of religion. And if they could not obtain what they wanted at home they emigrated to the New World and founded the colonies of North America.

QUESTIONS AND EXERCISES ON CHAPTER V.

1. What do you understand by the "Revival of Learning."

2. When was the printing press invented ?

3. How did the trading companies of the sixteenth and seventeenth centuries differ from the Merchant Adventurers and Merchants of the Staple ?

(Look up these matters in a Library.)

6. Why was there so much fighting at sea in the sixteenth century ?

CHAPTER VI

THE MERCANTILE SYSTEM

Object of Tudor Sovereigns. The affairs of agriculture, industry, and commerce in the sixteenth and seventeeth centuries were dominated by what is known as the Mercantile Policy. The Tudor monarchs wished to make England strong. They sought to make her wealthy because in their view to be wealthy was to be powerful, and they were for the most part strong, autocratic men and women who loved power. If the Treasury had gold, anything which the Government required could be obtained. They said : ① "If the goods which the foreigner buys are carried in English ships he will be more dependent upon us than if they were carried in his own ; therefore English shipbuilding must be encouraged and foreign shipbuilding discouraged. ② But so far as possible the ships must take out goods and bring back gold." Again, ③ "if the foreigner has to buy from us instead of we from him, we can dictate to him ; so the country must be self-supporting. In order that we may be self-supporting everyone must work, and agriculture and industry must be encouraged. ④ Further, in order that there shall be contentment within the land, wages and the conditions of labour must be regulated, or carried out in accordance with the law." This was the *Mercantile Policy*, which was the guiding star of English statesmen until the end of the eighteenth century.

Navigation Acts. This policy did not arise suddenly. No political policy ever does. There are experiments, years and sometimes centuries before. For example, one of the methods of encouraging the carriage of goods in English ships was to forbid their carriage in foreign boats—to forbid a foreign ship to load or unload its cargo in an English port. Acts which controlled shipping were called *Navigation Acts*, and the first was passed in 1381, during the reign of Richard II. This Act was renewed in the regin of Henry VII., because owing to the absence of a sufficient number of English ships it had not been enforced.

FIG. 13.—SHIP OF THE TIME OF FRANCIS DRAKE.

Shipbuilding encouraged. Both Henry VII., Henry VIII. and Queen Elizabeth encouraged the shipbuilding industry. In the reigns of Edward VI. and Elizabeth, fasting in Lent was recommended because, though it was a Roman Catholic custom, the demand for fish kept the fleet employed. Again, in the reign of

Henry VIII. an Act was passed which required that every man who cultivated sixty acres of land should grow a quarter of an acre of flax or hemp for the purpose of making rope.

The Iron Industry restricted. Perhaps the most remarkable instance of control is to be found in the restriction on the Iron trade. Until 1713 iron was smelted by the aid of charcoal; the charcoal-burners soon cleared a stretch of woodland, and they and the ironfounder had to move further afield. In this way the Weald of Kent and Sussex had been deprived of its forests and the iron trade had moved to the Midlands and the North. The cleared land was more or less useful for agriculture, but the oaks were of primary importance for ships, and Acts were passed in 1558, 1562, 1580 and 1584 limiting the number and position of the iron furnaces.

Distress in the Country. Let us glance now at the conditions of the people. The misery and distress which followed the Black Death continued throughout the fifteenth century. The enclosures were accompanied by the eviction of freeholders who could not produce their title, while enclosure of the common pasture rendered it impossible for those to live whose holding was too small to support them without the use of the common land to which they had been accustomed. Crops were poor, producing only about eight bushels of wheat to the acre, and wages, though twice as high as they had been a century before, were low in comparison with the cost of food. The cattle were weak, skinny creatures, producing but little milk or meat, and having little strength for the labour they had to perform.

The houses were wretched insanitary hovels, pestilence was common, and from 1455 to 1485 the *Wars of the Roses* vexed the land. It has been calculated that during this period one-tenth of the population met with early deaths through wounds or disease.

There was much unemployment. The whole country was infested by sturdy beggars who could not or would not work, and were a constant source of annoyance or even danger to those who desired to live peaceful lives.

This distress was caused largely by enclosures of land, by which people were thrown out of employment, and partly by the unsettled state of the country. Enclosures were of two kinds. The first, which took from the villagers the common waste for the purpose of sheep-farming, was bad for the country, because fewer labourers were required. That, on the other hand, in which the scattered strips of the landowner and his tenants were collected, so that each man farmed a compact area, was good. For, while no less labour was required, any man who had enterprise could make improvements. He was not tied down by his less enterprising neighbours.

Enclosures restricted and granted for a different purpose. A strong feeling grew up in the country against enclosures, especially those which affected the common waste, and an enquiry was held in 1517. After that permission was less readily obtained. Unfortunately, when Henry VIII. closed the monasteries from 1536 the courtiers into whose hands they fell did not concern themselves very much with justice and worked their new land on the old lines. But this was only for a time, and after 1550 enclosure was, as a rule, only undertaken in order to consolidate holdings, a practice against which there could be little objection.

Meanwhile industries were growing rapidly, and soon after the rise of sheep-farming the manufacture of home-made cloth began to be important. As we have already seen, this was encouraged by foreign workmen who, in order to avoid the restrictions of the gilds, settled in the country districts where supervision was impossible. A great deal of the spinning was done by the wives and children of men who themselves worked on the land. Moreover, as these men found that they could sell more yarn than they could spin, they sometimes took in pauper children as apprentices.

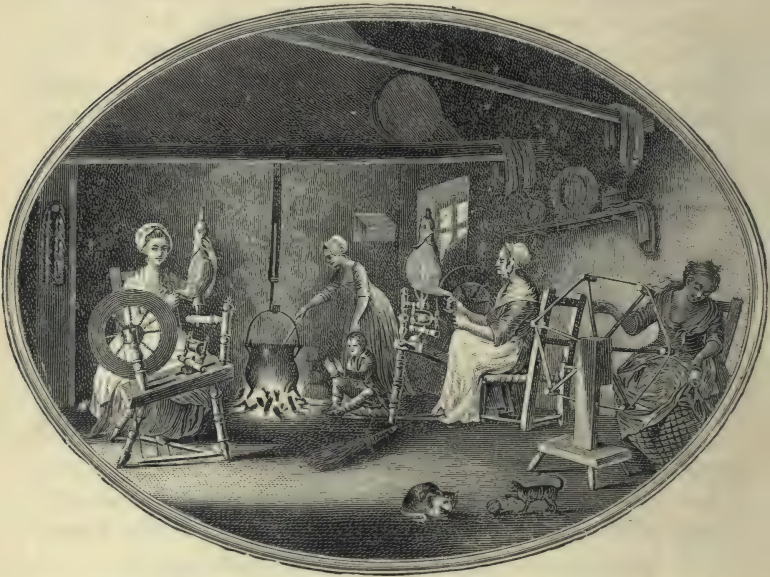

FIG. 14.—SPINNING, REELING WITH THE CLOCK-REEL, BOILING YARN.

The buildings were frequently unhealthy either to live or to work in, and the hours of work were long. The money made by spinning was often necessary for subsistence because the return from the land was so small. Sometimes, too, the conditions were rendered worse by the fact that the wool was in the hands of merchants or weavers who handed it out to be spun and would not pay a fair price for this work.

As weaving was a man's job, the weaver was not, as a rule, a farmer also. But he often owned several looms, took apprentices, and employed several journeymen. It was the women and children engaged in spinning who suffered most.

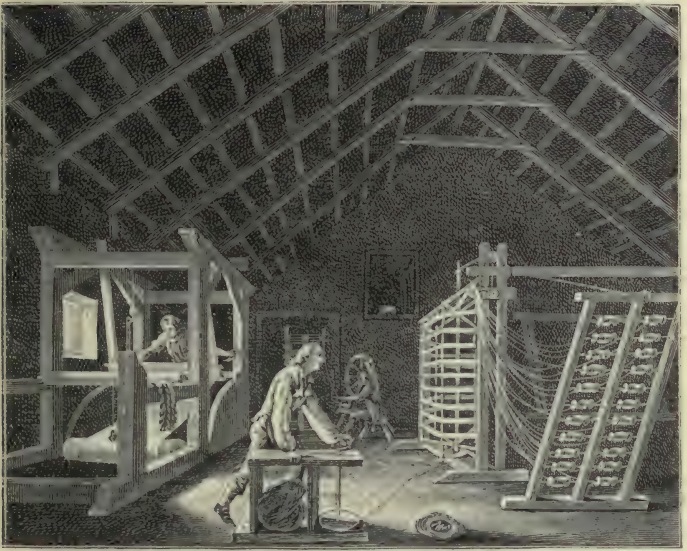

FIG. 15.—WINDING, WARPING, WEAVING.

The cloth trade was encouraged by laws which required English cloth to be worn, at any rate on Sundays and feast days. Foreign workmen were invited to settle in England for the purpose of creating new industries. The manufacture of copper, iron, sulphur, saltpetre were improved by men who, as the price of improvements, secured the sole rights to make these things. These "monopolies," as they are called, were unpopular, and were all swept away by the time of James II. But for the moment they were effective, and helped largely in the defeat of the Spanish Armada, which was beaten by superior guns and ammunition as well as by better ships and seamanship.

Statute of Apprentices. The decline of the gilds and the establishment of the industries outside the older towns, was in one way a disadvantage, because the trade could not be supervised. In order to secure this the famous Statute of Apprentices was passed in 1563. Under this Act no one could practice any craft unless he had served a seven years' apprenticeship, though he might in some cases change his trade. In some towns only the sons of well-to-do people were allowed to become apprentices at all, but there was no such restriction in the country. Wages were fixed by the magistrates. The Act was not merely one dealing with apprentices—it covered a far wider field, and it remained in force until 1813.

The Elizabethan Poor Law. Having provided work and regulated the conditions under which it could be carried on, the final effort of Elizabeth's Government was to make people work. But as there were then, as now, many who could not work, it was necessary to provide some form of relief which would distinguish between the idle and the helpless. The Poor Law of 1601 was the result of a long series of experiments. It was rendered necessary ① owing to enclosures, ② to the abolition of the monasteries, and ③ to the decreasing power of the Church; there was now no one who made even a pretence of looking after the helpless and needy. Magistrates were authorised to levy rates, overseers were appointed, those who could work were given something to do, and those who would not were punished.

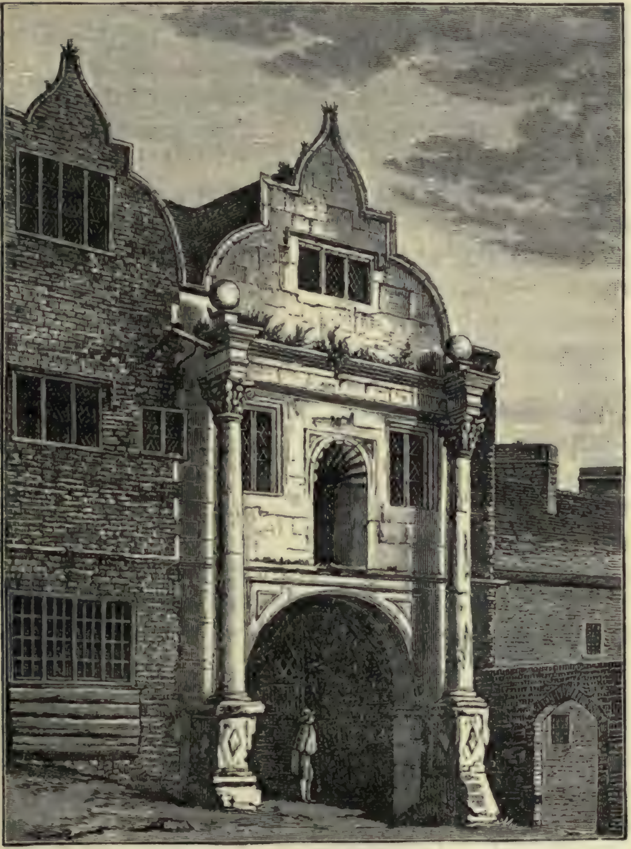

FIG. 16.—READING POOR-HOUSE. BUILT 1727.

Prosperity. The result of all this legislation was that the country increased in population and prosperity. The people spread into the thinly populated northern counties, so that at the end of the seventeenth century they were as numerous there as they were in the south. The demand for food increased and improvements in agriculture were made. The old plan of putting lime on heavy soils and marl, or clay on sandy soils was revived. Better crops of hay, clover, and turnips enabled a larger number of cattle to be kept throughout the winter, whereas many had formerly to be killed and the meat salted. Moreover, this also increased the quantity of manure, so that the fertility of the land could be maintained, and the wheat crop rose to twenty bushels an acre.

Among new industries, silk and cotton were becoming important, though the laws prevented them from competing seriously with English wool. The hosiery knitting machine was invented by *William Lee* of Calverton, in Nottinghamshire, in 1589, but meeting with no success in England, the inventor spent the remainder of his life in France. John Lee was granted a monopoly for the process in London in 1660. The stockings knitted on this machine were neither webbed nor shaped, so that they could have been neither very comfortable nor elegant. Lace was still made by hand and was, in consequence, a luxury.

The increasing prosperity is shown by the fact that buildings all over the country became more comfortable. The reason for the moated castle had gone, for it was no protection against artillery. Wealthy lawyers and merchants were becoming landowners, purchasing estates or marrying into old families, and building fine country mansions in which a high-pitched roof replaced the old battlements, and glazed windows the narrow loop-holes of the older style. There was civil war, and there were religious difficulties; but on the whole people were prosperous, and those who were discontented sailed to the new colonies across the wide Atlantic.

QUESTIONS AND EXERCISES ON CHAPTER VI.

1. Set down briefly the aims and methods of the Mercantile Policy.

2. Compare the conditions of the people in the fifteenth and seventeenth centuries.

3. Explain briefly the "Statute of Apprentices." When was it passed?

4. Why was the Poor Law of 1601 necessary and how did it provide for dealing with poverty and idleness?

5. What improvements were effected in Agriculture in the seventeenth century?

6. What evidence is there of peace and prosperity in the sixteenth and seventeenth centuries as contrasted with the preceding period?

The Law of seventy passed in th
time of the Stuarts with the idea of making ever
parish ~~both~~ responsible for its own poor, B
allowing the local authorities to send the
workless immigrant back to his own parish thu
preventing the unemployed in one parish from
going to another parish where work could be fo

PART III

THE INDUSTRIAL REVOLUTION

I. THE AGE OF MECHANICAL INVENTION, 1700-1820

LANDMARKS OF THE INDUSTRIAL REVOLUTION, 1700-1840.

	Inventions which encouraged Manufactures.	Inventions and Events which facilitated Commerce.	Political Events.
1710	Darby used Coke for Iron Smelting. 1713. Newcomen's First Engine. 1714.		
1720			
1730		Marine Chronometer. 1730.	
	Kay's Fly Shuttle. 1738.		
1740	Huntsman's Cast Steel.		

LANDMARKS OF THE INDUSTRIAL REVOLUTION—*continued.*

	Inventions which encouraged Manufactures.	Inventions and Events which facilitated Commerce.	Political Events.
1750			
1760		Bridgewater Canal. 1761.	
	Hargreaves' Spinning Jenny. Watt's Steam Engine. 1765. Arkwright's Water Frame. 1769.	Metcalf's First Road. 1765.	
1770			
	Watt's First Engine sold. 1776. Crompton's Mule. 1779.		
1780	First Double-Acting Rotary Engine. 1782. Cort's Improvements in Puddling and Rolling. 1785. Cartwright's Power Loom. 1788.		

LANDMARKS OF THE INDUSTRIAL REVOLUTION—*continued.*

	Inventions which encouraged Manufactures.	Inventions and Events which facilitated Commerce.	Political Events.
1790			
	Bleaching Powder introduced. 1795.		
			Combination Act. 1798.
1800			First Factory Act—protecting pauper children only. 1801.
		The "Comet" on the Clyde. 1812.	
1810			
		Stephenson's First Locomotive. 1813.	
	Davy Safety Lamp. 1815.	Stephenson's Second Locomotive. 1816.	Second Factory Act—protecting all children. 1819.
1820			
			Combination Act repealed. 1824.
		Stockton and Darlington Railway. 1825.	Combination Act re-enacted. 1825.
	Neilson's invention of Hot Blast in Iron Smelting. 1828.		
1830		Manchester and Liverpool Railway. 1830.	First Reform Act, followed immediately by: 1832. Factory Act, including Women. 1833. Poor Law. 1834. Municipal Corporation Act, etc. 1835.

CHAPTER VII

AGRICULTURE IN THE EIGHTEENTH CENTURY

The Era of Reform. In the eighteenth century arose a succession of energetic reformers bent upon improving the methods of cultivation of the land and the quality of the cattle and sheep. The first of these was *Jethro Tull*, who was born in 1680, and who travelled in the south of France, where he observed how carefully the vine was cultivated. He showed the advantage of giving the plant plenty of room, and invented a machine which prevented waste in sowing, reducing the amount of clover seed from ten pounds to two pounds per acre. He also emphasised the importance of breaking up the ground to enable the roots to penetrate it, and of removing weeds which impoverished the soil and hampered the growth of the more useful plant. By his example he exercised great influence, and when he died in 1741 his methods had been widely adopted.

The next great reformer was *Lord Townshend*, brother-in-law of the famous statesman Robert Walpole. He followed Tull's methods, re-introduced the forgotten practice of dressing light soil with clay, enclosed the Heath near Norwich, and made valuable experiments on the rotation of crops. It was known that if crops were grown in a certain order, loss of fertility was largely prevented, and his object was to find which order gave the best results. Before the example of Townshend had time to be forgotten, *Coke* of Holkham, in Norfolk, began to show what could be done. In 1776 he began to farm land upon which "two rabbits fought for one blade of grass" and astonished everyone by his success. He grew excellent crops, bred fine sheep, planted fifty acres of trees every year, and in 1832 sailed in a ship made of oak grown from acorns which he had sown.

While Tull, Townshend, and Coke were improving the methods of cultivation, other men were improving the breed of sheep and cattle. The most famous of them was *Robert Bakewell*, who was born in Leicestershire in 1725, and succeeded to his father's farm in 1760. Directing his attention to the improvement of sheep, he reared the breeds known as Leicesters and New Leicesters which were less than double the weight of the older breeds, but "gave Englishmen two pounds of mutton where formerly they had been content with one."

A strong influence, indeed, perhaps the strongest, was also exerted by *Arthur Young*, an unsuccessful farmer, but a great traveller and a highly successful writer on agriculture. He was untiring in his efforts to secure better methods of cultivation, and his descriptions of his journeys in England and France are full of interesting and exact information of rural life in the latter half of the eighteenth century.

Revival of Enclosure. Now none of these improvements could be carried out where the open-field system prevailed, and the reform movement was again accompanied by enclosure. Moreover, the new methods required capital to a far greater extent than the older. Work had to be done and money spent before an increased return could be obtained.

The Decay of the Yeomanry. The small farmer had

Tull, Townshend, Coke, Bakewell, Young

now lost the aid (see Chapter VI.) which he had derived from the spinning which was done by his wife and children, and even if he were willing to enclose he could not do so. The result was that the land passed into the hands of relatively few, and the poorer man was often compelled to give up his holding and to go into the towns for work.

FIG. 17.—AGRICULTURAL WORK IN THE EIGHTEENTH CENTURY.

Some writers hold that the hardship and misery which followed the Black Death were repeated in the case of the yeomen who were displaced by the enclosures of the eighteenth century; but others consider that the evils of the later period have been much exaggerated. It will be seen from the following chapters that the period was one of rapid change, and when changes of this kind occur with such rapidity that they cannot be foreseen hardship is unavoidable. The only way to avoid it is to ascertain and watch carefully the tendencies of the time.

Demand exceeds Supply. In spite of all improvements, and the increasing use of machinery, English agriculture became less and less capable of supplying the amount of food required by the country. The population was growing rapidly. It has been estimated that the number of people in England and Wales in 1700 was about five millions, in 1750 about six millions, and in 1801, when the first census was taken, nine millions. After that the number rose very rapidly, becoming twelve millions in 1821, and over thirteen millions ten years later. But the increase was mainly in the towns. The new factories attracted labour, and a smaller proportion were engaged in producing food from the native soil. Imports of wheat increased and exports decreased until between 1770 and 1790 they were equal, and since the latter year we have depended upon foreign sources for an increasing proportion of our food.

During the Napoleonic Wars the supply of wheat from eastern Europe was frequently interrupted and the price fluctuated to an extraordinary degree. Eighty shillings a quarter was the normal price, but on some occasions it rose to over one hundred and thirty. In 1918, after four years of war, it was only seventy-four. Such high prices were welcomed by farmers, but they produced a great deal of suffering among poor people, who found that their wages remained constant when the price of food varied.

After 1815, agriculture became less profitable. The soldiers of Wellington's Army came home and provided plenty of labour, so that wages fell. Again, taxes were high, rents were difficult to collect, and a succession of wet seasons resulted in great damage to the crops. Some farmers too had learnt luxurious habits while they were prosperous, and they found a difficulty in making both ends meet when the return on the land fell. The hard times lasted for twenty years, and it was not until about 1840 that farming again became profitable.

Questions and Exercises on Chapter VII.

1. State generally the improvements in agricultural methods in the eighteenth century.

2. Why was the process of Enclosure revived? How did it differ from that of the earlier period?

3. What were the effects of Enclosure during this period? (See also Chapter III.)

CHAPTER VIII

COAL MINING

Value of Coal not at first recognised. Coal is the most important of Great Britain's natural resources, and when we reflect how many of our present-day advantages depend upon this fuel, the wonder is that its value remained undiscovered for so many centuries. The fact that the black substance cropping out on the hillsides would burn was known in very early times, and some people burnt it. But very few, because the grates of those days were not constructed to burn it well, and the fumes and smoke which escaped into the dwelling were very unpleasant.

Occasionally a ship-load of it reached London and other southern towns, and as it came by sea it was called sea-coal, though the northerners called it pit-coal. But it was not used by people who could obtain timber, even in Queen Elizabeth's day, and the Queen herself especially detested it. It was used in beacons for lighting the coast, but not for iron-smelting until after 1700. Once, however, its value for that purpose was recognised, the amount mined increased by leaps and bounds, and when the steam engine commenced to eat it up its value rose tremendously.

How Mined. The method of obtaining it was to drive an adit level, or nearly horizontal tunnel, into the hillside where the coal was known to be, and then to make a vertical pit to meet the end of the tunnel. The coal was worked out all round the foot of the pit or shaft and conveyed up the shaft in baskets by means of a winch, or by ladders. The main purpose of the adit was to enable water to drain away, and of the shaft to provide ventilation. For this purpose a fire was often lighted at the bottom of the shaft. If the seam of coal dipped downwards towards the end of the tunnel water drained away easily; but when, as sometimes occurred, the miners had to follow the seam downwards, they were liable to be drowned out.

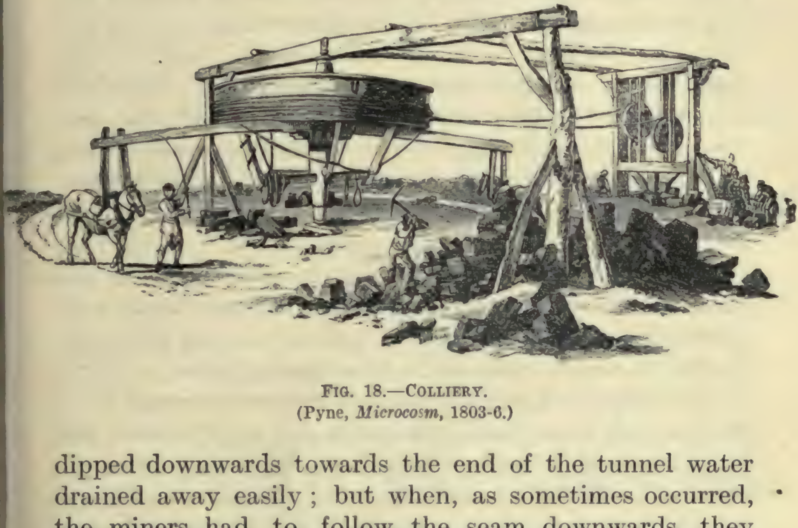

FIG. 18.—COLLIERY.
(Pyne, *Microcosm*, 1803-6.)

The pits were seven or eight feet in diameter, and of any depth up to 180 feet. It was not possible to work the coal from a greater area than about 200 square yards near the bottom of each shaft on account of the difficulties of ventilation. The miners could not work in total darkness, and as many varieties of coal give off a gas which, when mixed with air, is highly explosive, it was necessary that a brisk current of air should pass over the coal face in order to remove the gas as fast as it was liberated. About 1760 a man named Spedding showed how to direct the air through the workings by fixing doors which prevented it circulating in the wrong direction.

Trouble with Gas and Water. In those days a pit had not a very long life. Sooner or later water or gas got the mastery. Then Newcomen's engine enabled miners to meet the water difficulty, so that pits as deep as 300 feet were sunk. In 1780 Watt's engine was used for the first time to raise coal to the surface. Without the steam engine our vast stores of coal would have remained almost untouched to this day. It consumed coal, but it pumped the water out of the flooded mine and raised far more than it needed to do the work. Pits became deeper and more numerous as the demand for coal increased.

But with deeper mines it was more difficult to get rid of the gas ; the ordinary means of ventilation were insufficient, and sometimes it had to be got rid of by creating a small explosion. At a Staffordshire pit early in the eighteenth century special men used to go down into the pit three times a day—at 4 a.m., 12 noon, and 7 p.m.—thrust a lighted brand near the roof, where the gas was to be found, and then fling themselves flat on their faces to escape the force and flame of the explosion. Mining never was work for timid men.

The Safety Lamp. Nevertheless explosions, attended by loss of life, occurred, and in 1813 a "Society for the Prevention of Accidents in Mines" was formed at Sunderland. *Sir Humphry Davy*, the great chemist, was called in to assist, and he invented the famous safety lamp which bears his name. The flame of the lamp was surrounded by a mantle of wire gauze which conducts heat so readily that the flame will not easily pass through the mantle. The hot gases are so cooled by the metal that they cease to burn in close proximity to the gauze.

About the same time, *George Stephenson*, who was then an engineman at Killingworth Colliery, applied himself to the problem. Working independently of Davy he constructed a lamp in which the air that entered and the hot gases which left the flame had to pass through fine holes in the metal casing. The flame in this lamp was surrounded by a glass chimney. Neither lamp was quite safe, and explosions have occurred where they were used ; but the lamps enabled coal to be obtained from pits in which naked lights could not be used and they have undoubtedly saved thousands of lives.

Condition of Miners. Until 1854 no records were kept of the amount of coal raised, though probably at the beginning of the eighteenth century the total quantity was not more than a few thousand tons a year. But when coal came to be employed for making iron and for producing mechanical power the output increased enormously, and it has been estimated that in 1800 no less than 10,000,000 tons were consumed in England alone, while not more than 100,000 tons were used by the rest of the world. For these ten million tons not less than ten, and it may have been twenty, thousand men, women and children laboured in the bowels of the earth. Amid dust and dirt and impure air, in roadways with a roof so low that they could not stand upright, they worked for twelve or fourteen hours a day at the heaviest tasks. Mechanical haulage was not even introduced on the surface until 1820, the year in which gunpowder was first used for blasting the coal, and the tools were of the clumsiest description. Every year a thousand of them were killed and several thousands injured.

Living in remote districts rarely visited by people of feeling and influence, and performing their labour out of sight of casual passers-by, few persons realised the hardship, the suffering, and the horrors which every ton of coal involved.

The wages were twice as high as in agricultural districts, but the conditions were far worse. Labour was hired by the year, and the employer often claimed the right to supply houses, food and clothing, to charge what he liked for them and to stop payment out of wages. The Truck System, as this plan is called, has long since been rendered illegal; but it was often the cause of trouble in the early part of last century. A great many of these evils arose because the industry grew so quickly. The demand for coal was not expected; neither Parliament nor people knew what was going on in the new industries; and in many instances changes occurred so quickly that men did not know what to do. And the fact that the nation was almost continually at war from 1756 to 1815 drew men's minds away from matters which needed urgent attention at home.

Questions and Exercises on Chapter VIII.

1. How was coal mined in the eighteenth century?

2. What limited the amount of coal won and how were the difficulties overcome?

3. What was the Truck System?

See 187

CHAPTER IX

THE IRON-MASTERS OF THE EIGHTEENTH CENTURY

We live to-day in an age of iron, and it is difficult to realise how the work of the world was carried on two hundred years ago when the production was hundreds of times smaller than it is now. There was plenty of ore in the country, but charcoal was needed to get the metal from it, and many of the forests had been cleared. Moreover, the need of oak for shipbuilding had led, as we have seen, to restriction of the iron industry, and the country had become largely dependent upon Sweden, Russia, and northern Germany for what it required.

The use of Coke for Smelting Iron. In 1619 a smelter named *Dud Dudley* had actually succeeded in obtaining iron from the ore by the aid of coal. But the charcoal burners were up in arms lest their trade should be injured, and the other iron-masters were anxious neither to change their own methods nor to permit what might be a better method to be developed peacefully.

During the next hundred years the position of the iron trade grew worse, and, about 1713, an iron-master named *Abraham Darby* of Coalbrookdale, finding timber scarce, tried coke which he obtained by partially burning coal in heaps. He did not pursue the matter very far, but his son, also called Abraham, began to use coke regularly twenty years later. The time was now ripe for the change. Timber was getting still scarcer, and the demand for iron was still growing, so many other iron-masters cast aside their prejudices, set up their furnaces near the coal-fields, and began to smelt iron in the new way.

Discovery of the method of making Cast Steel. About the same time that the Darbys were making their experiments on iron, another man was busy with the manufacture of steel. He was *Benjamin Huntsman*, the son of a German, who had settled in Lincolnshire many years before. Steel differs from iron in the amount of carbon it contains. Iron as it comes from the blast furnace contains five or six per cent. of carbon, is easily melted, and can be cast in moulds, but is very brittle. Melting it in a furnace with a strong blast of air burns out the carbon, leaving nearly pure iron, which melts at a high temperature, passes through a pasty stage before becoming fluid, can be bent into almost any shape hot or cold, and when very hot can be joined by welding. Steel contains from 0·1 per cent. to 2·5 per cent. of carbon, is stronger than wrought iron, less brittle than cast iron, can be worked on the anvil or cast in the foundry, and when cooled suddenly while hot it becomes very hard.

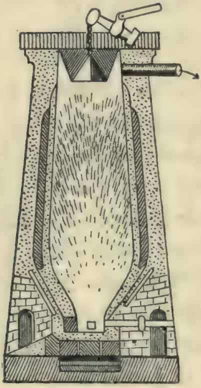

FIG. 19.—SECTION OF A BLAST FURNACE.

Benjamin Huntsman was a clock-mender at Doncaster and was dissatisfied with the steel imported from Germany for making springs. So he conducted many experiments with the object of securing material of better quality. In 1740 he removed to Sheffield and as the result of many years of patient effort he discovered that if Swedish iron, then the purest obtainable, were melted in a clay pot with charcoal the two combined to form steel of finer quality than any made in Europe.

He could have patented the process, but preferred to keep it a secret—perhaps because the law was more difficult to set in motion than it is to-day. His rivals endeavoured to learn his process and, being unsuccessful, they petitioned Parliament against him, besides pestering him in other ways. Finally the secret was discovered, and from that day Sheffield has been the foremost town in the world for the production of steel.

Improvements in manufacture of Wrought Iron. For more than forty years the work of Darby and Huntsman stood almost alone. Small improvements were made by others, but they had very little effect upon the quality or quantity of the metal produced. English iron was held in such low esteem that, as *Henry Cort* discovered, the English Government preferred iron from Russia and Sweden, and the Russians, realising that preference, made them pay heavily for it.

Wrought iron was prepared, as has been already explained, by burning out the carbon from the pig-iron of the blast furnace, and then hammering and rolling it into plates or bars. Cort was convinced that English iron could be improved. He set up a forge at Fareham in Hampshire in 1775. After much labour he improved existing processes, and in 1784, showed how iron far superior in quality could be made. Soon after he had taken out his patent misfortune fell upon him. The Government seized his works, but took no steps to prevent other iron-masters working the process without payment. So Cort died in abject poverty while other men grew rich upon the use of his invention.

Though not the actual inventor of the puddling furnace and rolling mill Cort had immensely improved the method of working them. One man alone, who in 1787 was making ten tons of bar iron per week, was making ten thousand tons in the same period in 1812. It has been estimated that only 18,000 tons of iron was produced in England in 1740. In 1784 the amount had risen to 90,000 tons mainly as a result of the discoveries of Darby and Huntsman. But in 1820 by the use of Cort's process it had risen to 400,000 tons. Moreover it was unsurpassed by any in Europe for every purpose but steel-making, for which the famous Swedish iron still held the palm.

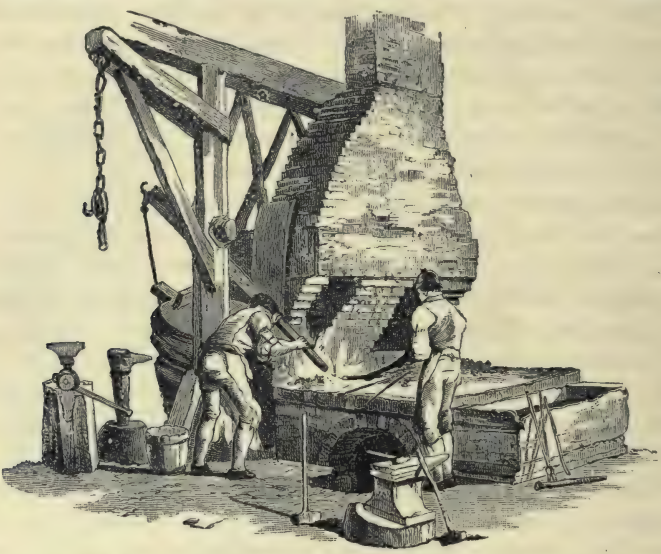

FIG. 20.—IRON FOUNDRY. (Pyne, *Microcosm*, 1803-6.)

Value of these improvements. This great increase in the production of iron not only rendered us independent of foreign sources of supply, which might at any time have been closed to us by war, but it encouraged the making of steam engines and machinery, provided a vast amount of employment, created a new race of clever, accurate, and resourceful mechanics, and in every way contributed to the national strength at a time when we were surrounded by foes. But that must be left for another chapter.

QUESTIONS AND EXERCISES ON CHAPTER IX.

1. Why was it a great advance to use coke instead of charcoal in iron smelting ?

2. Describe the difference between cast iron, wrought iron, and steel.

(Look this up in a Library.)

3. Look up and then describe the " puddling process " and the " rolling mill."

4. What, generally, was the effect of the improvements of iron and steel manufacture during the eighteenth century ?

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CHAPTER X

THE STEAM ENGINE

The most important fact which distinguishes the past hundred and fifty years from all other periods in history is the use of mechanical power. All sorts of devices had been invented for avoiding unnecessary labour—the sledge, wheeled carts, the windmill, and the water-wheel—but in all the years in which man had been acquainted with hot water and the force of steam, he had never succeeded in persuading it to do useful work for him.

Early Steam Engines. Two thousand years ago, *Hero*, a learned Greek of Alexandria, had supported a metal vessel on bearings over a lamp in such a way that steam was generated in it; and in 1619 *Branca*, an Italian, had caused a wheel fitted with vanes to spin round by directing a jet of steam upon the vanes. *Papin*, a Frenchman who lived for some time in England and made many experiments, was the first man to cause the steam to act on a piston or plug enclosed in a cylinder. He succeeded in 1706 in constructing a pump which raised water, but the workmanship was too faulty for it to command success. Then *Captain Savery* tried to make a steam pump to rid the Cornish mines of water, which, as the mines got deeper, was passing beyond the control of hand pumps; but he too was beaten.

Newcomen's Engine. The first man to succeed was *Thomas Newcomen*, a blacksmith of Dartmouth. He used a vertical cylinder with the upper end open. When steam was admitted underneath the piston, the latter was forced upwards. Water was then sprayed into the cylinder and as steam at the boiling point occupies more than 1,600 times the volume of the water from which it is formed, the steam in the cylinder was condensed, a vacuum was produced, and the pressure of the atmosphere forced the piston down again. This process was repeated by opening and closing taps at the right moment. An ingenious boy, set to this task with one of the earlier engines, saved himself trouble by attaching the taps by cords to the moving beam so that they opened and closed without his assistance.

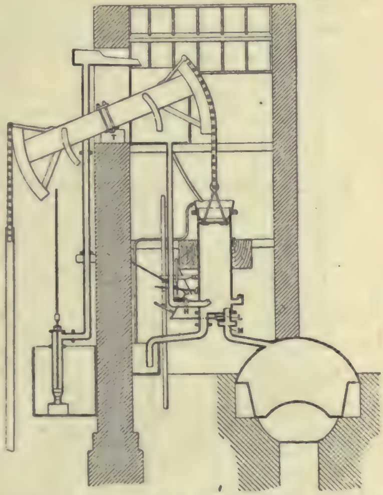

FIG. 21.—NEWCOMEN'S ATMOSPHERIC PUMPING ENGINE. 1726.

Though Newcomen made a working model in 1705, it was not until 1713 that his first full-sized engine was erected. This was at a mine near Wolverhampton. Orders soon began to flow in and other people undertook to make the engines. Though there is not much information about the life of Newcomen it is known that he died in London on August 5, 1729, and in

July, 1921, a monument was erected to his memory at Dartmouth.

Unfortunately Newcomen's engines were very expensive to maintain. They swallowed up coal at an enormous rate—some of those erected to free the Cornish mines from water consumed more than twelve tons a day. There was still much to be done before the steam engine could be regarded as a really efficient and useful source of power, but the necessary improvement required a degree of scientific knowledge, practical skill, and perseverance which few men possessed. Among these few was James Watt of Glasgow.

Watt's Improvement. *James Watt* was the son of a carpenter and shipwright, and was too delicate to be apprenticed to his father's trade. After a short apprenticeship to an optician in Glasgow, he proceeded to London for a year to gain experience, and on returning to Glasgow he was prevented from setting up in business in the ordinary way because he had not served an approved apprenticeship. Ultimately he secured a room in the University Buildings, where he repaired scientific apparatus, musical instruments, and made a living by any odd mechanical job that came along.

He became interested in the steam engine and read everything about it that he could find. Called upon to repair the model of Newcomen's engine belonging to the University, he set himself to discover the causes of its failure. For four years he had been reading and thinking about steam engines, and for two more he was puzzled over the defects of the model. Meanwhile he had married, had given up his room at the University, and found it by no means easy to earn a living, or to secure time for experiments. Nevertheless he persevered, and the solution of the problem came upon him like a flash when taking a walk on Sunday afternoon in the spring of 1765.

It will be remembered that in Newcomen's engine water was admitted to the cylinder after every upward stroke

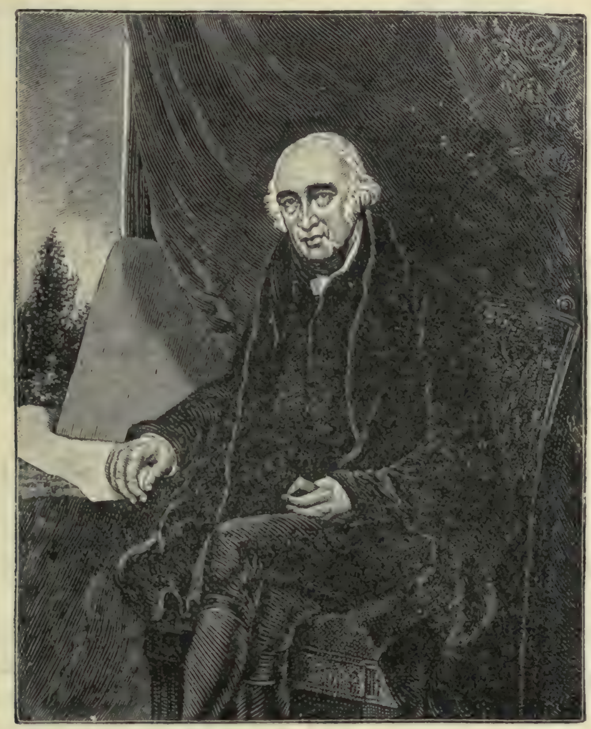

FIG. 22.—JAMES WATT.
(After a portrait by Sir T. Lawrence.)

to condense the steam. The walls of the cylinder were thus alternately heated and cooled, and every time steam entered, some of it was condensed by yielding up its heat to the cylinder walls. Watt argued that if the steam, after it had done its work, could be passed into a separate vessel for condensation, the cooling would be avoided. He realised, in fact, that the steam engine was a heat engine, that the steam acted by virtue of its hotness, and that the heat which it contained should not be wasted in warming the cylinder walls.

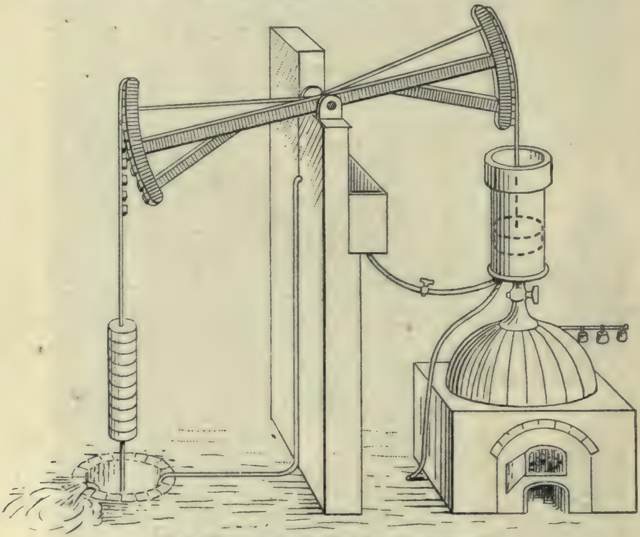

Fig. 23.—Newcomen's Model Engine.

Early Disappointments. The very next day he constructed a model from some odd pieces of apparatus, and performed an experiment which showed that his reasoning was correct. But a model was no use. He must construct a full-sized engine before he could hope to convince people that his invention was of real value. And that was far beyond his means. After several years of anxiety he secured help from *Dr. Roebuck*, who had founded the Scottish iron industry. An engine was built, but proved unsatisfactory. There were no skilful mechanics in Scotland in those days, the cylinder had to be made of sheet metal, and his piston did not fit. Before another could be built Dr. Roebuck got into financial difficulties and Watt suffered further disappointment.

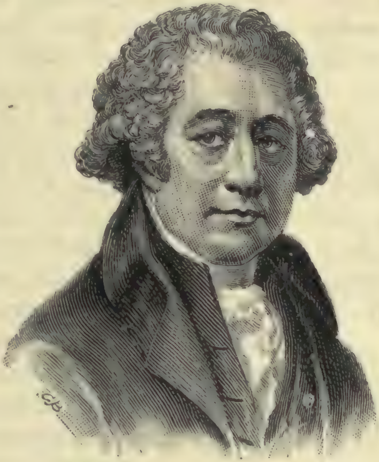

FIG. 24.—MATTHEW BOULTON.

When the prospects seemed hopeless Watt met *Matthew Boulton* of Soho, Birmingham, and succeeded in effecting a partnership with him. At the Soho Works were tools and skilled workmen, the like of which were not to be found in Glasgow, nor scarcely in any other town in Great Britain. It was now 1773, eight years since Watt had made his discovery and four years since he had taken out his patent. He could make engines, but he was not clear of trouble. There were rivals in the field, none of them with strong claims, but still able to make things unpleasant. Moreover, his partner had many irons in the fire and the firm came to grief.

But Matthew Boulton was a great man—fearless, upright, honest as the day ; a man of great determination and resource, with charming manners that endeared him to all with whom he came into contact. And he steered the ship safely through the shoals.

Final Success. The first engine was erected in 1776 to blow the bellows in John Wilkinson's Iron Works at Broseley and was soon in demand in the Cornish tin mines, where the Newcomen engines were consuming twice as much coal as Watt's, and even then failing to keep the mines free from water. Within a few years steam engines were driving rolling mills, flour mills, cotton mills, weaving sheds and the machinery of coal mines, so that by 1790 every kind of machine then in use was deriving its power from Watt's invention. Great improvements were made in 1782, and there was a steady advance in workmanship. The patent specifications filed in that year contain all the really important principles involved in the production of power from steam which were recognised until 1884. Watt did not employ them all in the engines he built, but in his scientific insight he was easily fifty years ahead of his time.

Throughout the whole of his life he had bad health, and frequently suffered from severe headaches. He lacked the patience and good temper of Matthew Boulton. He hated public life, and especially detested the business meetings which he was called upon to attend. He loved to be among his books, in his laboratory, and in the workshop among the rods and levers and wheels which had occupied his thoughts for so many years. In his partnership with Matthew Boulton we see how men of very different temperament can work together to achieve what neither could have done alone.

Questions and Exercises on Chapter X.

1. Write a short account of the history of the Steam Engine before Watt.

2. What was the essential improvement which Watt made in Newcomen's Engine ?

3. Under what disadvantages did Watt suffer ?

4. Who was Matthew Boulton, and what was his connection with the Steam Engine ?

CHAPTER XI

THE TEXTILE INVENTIONS OF THE EIGHTEENTH CENTURY

Growth of Textile Industry in preceding period. We have seen how, in the later Middle Ages and during the period of expansion, the weaving of woollen cloth became one of the chief industries of the country. We have seen, moreover, how the trade was developed mainly by foreign workmen who settled in England, either by invitation or to escape religious persecution abroad. But these men were weavers of all kinds of cloth. Many of them worked in silk, which had been used for garments in China for four thousand years. Many more worked with the fibre of the flax plant, making linen such as that woven by the people in the East almost before the memory of man. And in the seventeenth century came still others who employed the delicate fibre which surrounds the seed of the cotton plant, a material which the nimble fingers of the natives of India had utilised with marvellous dexterity when our ancestors were clothed in the untanned hides of the beasts they had killed for food. The cotton spinners and weavers, like the workers in wool before them, had settled in the newest towns, which had the fewest restrictions, and especially in the moist valleys west of the Pennine Chain, because cotton cannot be spun in a dry atmosphere.

At first the industry developed slowly because the interests of the cloth trade were closely guarded, but it gradually made headway; the towns in which it was established began to grow, and by the end of the seventeenth century Manchester, for example, was a place of considerable importance with a reputation for the new material.

The Spinning Process. In olden times the fibre to be spun was first *cleaned* and then *combed* or *carded*, the former term being used in connection with wool and the latter when cotton or flax was concerned. The primitive spinning appliances were the distaff and spindle. The distaff was a wooden stick, having a ball of the combed or carded fibre at the end; and the spindle was a smaller stick with a cleft in one end and a lump of clay, or a heavy disc, at the other so that it could be spun round easily. A bit of the fibre was drawn out, fixed in the cleft on the spindle, and twisted, this process being repeated until the thread or yarn was long enough to be wound up. Twisting enabled the nearly parallel fibres to "grip" one another, and gave strength to the thread.

About the year 1530 some genius, whose name has never been discovered, rotated the spindle by a large wheel, which could be spun round by hand, and an endless cord. Holding the fibre in one hand, he gave a rapid turn to the wheel with the other, at the same time twisting the thread as it left the ball. A few years later another nameless benefactor rotated the wheel by a treadle, rendering the process of spinning continuous instead of intermittent.

Weaving. To understand the process of weaving, imagine a large number of parallel threads wound on a roller, and unwound by the rotation of another pair of rollers several feet away, between which the ends of the threads are clipped. These threads are called warps. Each of the parallel threads passes through a loop in another thread hanging vertically. In the simplest example the vertical threads would be suspended from two bars, the odd threads to one and the even threads to the other. If one of the bars is raised and the other lowered the odd and even warp threads form a > and a cross or weft thread can be passed through just inside the angle. Lowering the upper bar and raising the lower one encloses the weft, and the weft thread, which is wound on a shuttle, can be passed back again. At each stage a thread crosses from one side to the other, alternately under and over successive warp threads.

Invention of the Fly-Shuttle. The first important textile invention was an improvement of the loom. *John Kay* of Bolton, in 1739, arranged a pair of hammers, one at each side, which drove the shuttle carrying the weft backwards and forwards in its path. This flying shuttle did not come into regular use for thirty years. Spinning was then a very slow process, and though many women and children were engaged on it, working in their own homes, one man, working a heavy, clanking loom, could use up the yarn from five or six spinners as fast as they could make it.

Invention of the Spinning-Jenny. But in the year 1765, *James Hargreaves*, a poor spinner living in Bolton, thought of making one wheel, worked by a treadle, turn a large number of spindles at once. He soon made one which turned eight and it was easy to see that a hundred or more might be turned in the same way. The carded strands of cotton were held between two boards which could move along guides towards or away from the spindles, the cotton being drawn out, and twisted and wound alternately.

For a time the invention was kept secret, but people got to know and other spinners, fearing to lose their work, broke into his house, smashed up his machine and drove him from the town. Nothing daunted, Hargreaves built another machine, which he patented in 1770, and many others adopted it. Yarn would have been produced more quickly than it could have been used, but for the fact that spinning was a domestic or commission industry —"domestic" because it was carried on in the homes of the people who derived their principal means of livelihood from the land, and "commission" because the raw wool, cotton, or flax was mostly bought up by merchants or weavers who handed it out to be spun as necessity arose.

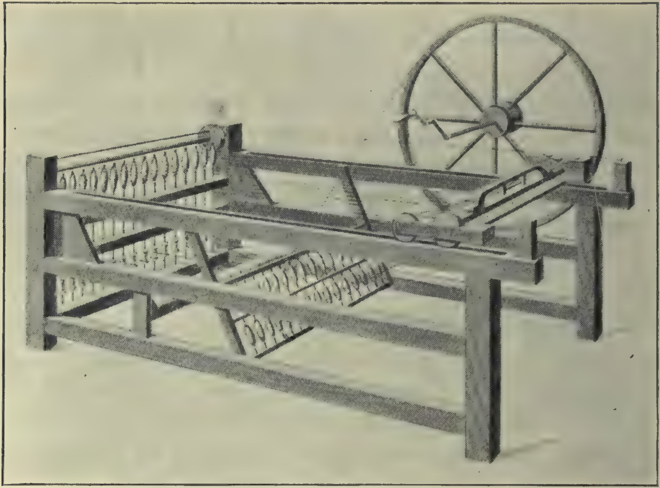

FIG. 25.—HARGREAVE'S SPINNING JENNY.

Invention of the Water-Frame. Hardly had Hargreaves' spinning-jenny been completed when *Richard Arkwright*, a barber also of Bolton, invented another machine for the purpose. In his case the carded cotton was drawn successively between pairs of rollers, each pair turning more rapidly than the pair before it, and finally twisted and wound on to a bobbin. The process was continuous, like that of the treadle or Saxony wheel, and though the thread was not so fine as that made on Hargreaves' machine it was sufficiently strong to replace linen as

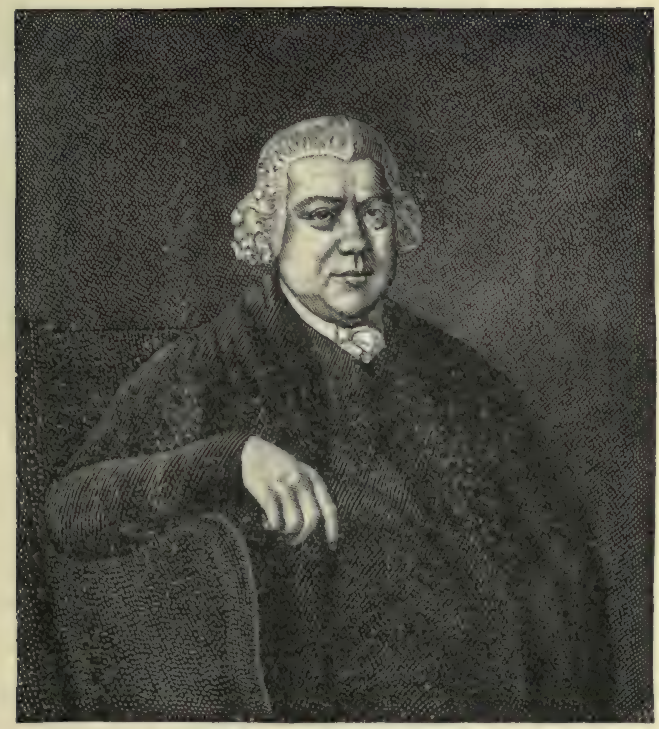

FIG. 26.—RICHARD ARKWRIGHT.
(Picture by Wright of Derby.)

warp, rendering an all-cotton cloth possible for the first time.

Spinning was now a much more rapid process than weaving. The old balance had been completely upset. The new machines were not only more speedy, but they required the use of mechanical power. Arkwright's invention was called a water-frame, and was intended to be driven by a water wheel, though those who were remote from a waterfall had to use horses. A great many spinners were thrown out of work, and more would have suffered if it had not been for the invention of the fly-shuttle by John Kay. This device enabled cloth of twice the width to be woven, and probably increased the speed as well. So after thirty years' neglect his plan came into full employment and did something to restore the balance between the two processes.

However, the competition still continued, and fresh advances were made on both sides. In 1779 *Samuel Crompton* improved Hargreaves' jenny and constructed a machine which came to be called a mule. This was made self-acting by Roberts in 1830. Again, in 1787, the Rev. Edmund Cartwright invented the power-loom. Both these machines were soon driven by steam engines, though water-power was employed in many mills even in 1850. Improvements in Arkwright's water-frame resulted in the " throstle " spinning machine, so-called from the musical note it emitted when working, and a hundred years later this was replaced by the ring-spinning machine of to-day.

Opposition to the New Machinery. Of all these inventions the power-loom met with the greatest opposition. For years the hand-loom weavers fought against it, and when the price of cloth fell so that they could no longer make a living at their trade they emigrated in large numbers.

It is sometimes difficult in these days to convince men that, in general, the use of machinery cheapens goods and increases the demand; and that even if less labour is required, the increased demand for the cheaper goods or for other things actually increases the need for labour. In spite of the use of machinery in ever-growing amount during the last hundred and fifty years, the population has increased more than six-fold and is many times more prosperous. But it was especially difficult to

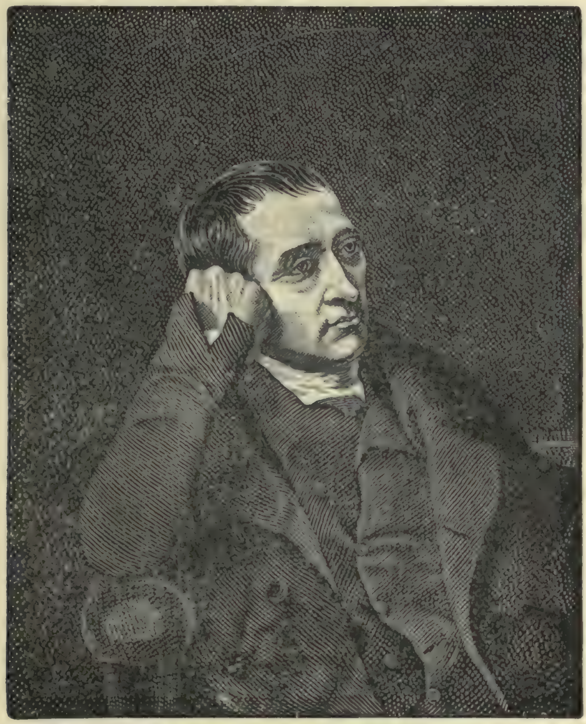

FIG. 27.—SAMUEL CROMPTON.
(Portrait by Allingham.)

convince men who saw only their own present and who felt that " a bird in the hand was worth two in the bush."

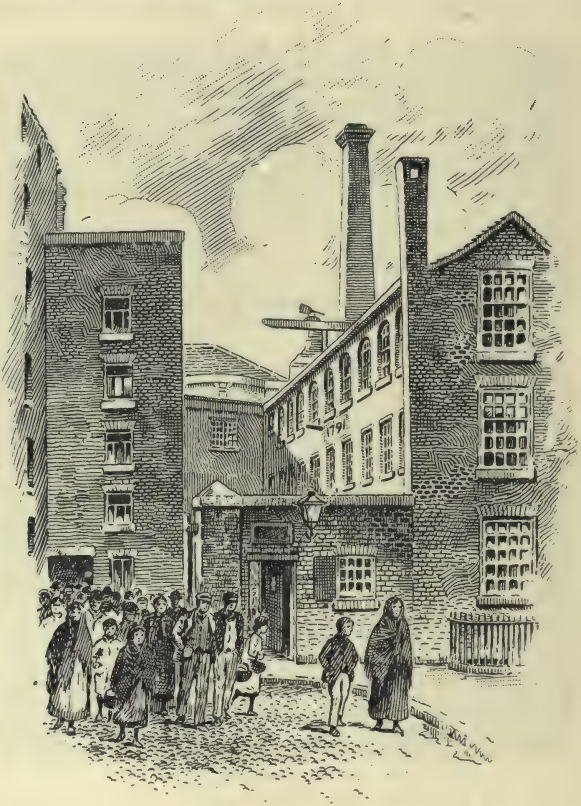

FIG. 28.—YELLOW FACTORY (FIRST MILL BUILT BY JOHN HORROCKS, PRESTON), 1791.

Expansion of Cotton Industry. Though the machinery was applied ultimately, with modifications, to all textile industries, cotton alone benefited for many years. It was concentrated for the most part in Lancashire, partly because the climate was particularly suitable and partly owing to the presence of coal. Woollen spinning and weaving was, in this country, at any rate, an older industry in which the methods had become habits not easily altered. Moreover, it was less dependent upon moisture in the atmosphere. The factories were distributed widely over the country—in the eastern counties, the west country, Ireland, Scotland, and the north of England—and it was only very slowly that the industry became concentrated in the West Riding of Yorkshire. The nineteenth century was, indeed, well advanced before this occurred.

QUESTIONS AND EXERCISES ON CHAPTER XI.

1. Write down the names of the Textile Inventors of the eighteenth century, with the titles and the dates of their inventions.

2. Why did not the fly-shuttle come into immediate use? What ultimately enabled it to make headway?

3. What class of worker was most opposed to the introduction of Power, and why?

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CHAPTER XII

ROADS AND CANALS

Wretched state of Roads. The great development of the Textile, Mining, and Iron and Steel industries would have been impossible if attention had not, at the same time, been directed to the improvement of means of transport and communication. For at the beginning of the eighteenth century we had no canals, the rivers were navigable only for short distances by small craft, and the roads have been described as the worst in Europe. Many of them were mere tracks, and, where they crossed low-lying ground, impassable for weeks together when the floods were out. Even those between important towns had ruts three or four feet deep in soft places, and these were filled with mud in wet weather. It was no uncommon thing to see carts stuck fast with the wheels buried up to the axles.

For hundreds of years there had been no improvement. A document of 1339 referring to the second Parliament of Edward III. states:—"That since prelates, earls, barons and other lords and knights of the shires, citizens and burgesses of cities and boroughs were so troubled by bad weather that they could not arrive that day, it would be proper to await their coming." Again, Lord Macaulay has placed it on record that "the death of Queen Elizabeth was unknown to her subjects in

Devon until the Courtiers had ceased to wear mourning, and Oliver Cromwell had been dead for nineteen days before the fact was known at Bridgewater."

Obstacles to Improvement. The Government was aware of the need for roads, but unwilling to bear the cost. In 1663 the first *Turnpike Act* was passed, authorising the construction of roads and the collection of tolls to meet the expense. To these tolls people strongly objected, and in 1753 a raid, which was only crushed by military assistance, was made upon all the toll-gates in Yorkshire. The new industries, however, rendered better roads absolutely necessary, and between 1760 and 1780 no fewer than six hundred Turnpike Acts were passed.

FIG. 29.—JOHN METCALF.

A Pioneer Road-maker. The first great road-maker in England was *John Metcalf* of Knaresborough. Though blind through an attack of small-pox when six years of age he had a most adventurous career. He learnt, while still a boy, to climb trees, to play the violin, to ride a horse, and to indulge in all sorts of exercises and amusements that are usually possible only to those who possess sight. In 1740, when he was twenty-three years old, he went to London with another man, and walked the whole two hundred miles back to Harrogate by himself. Dissatisfied with music as a means of livelihood he set up a coach which he let out on hire, and hawked fish between Leeds and Harrogate. Then he helped a gentleman named Thornton to raise a body of horse soldiers and marched with the Royal Army to quell the Stuart rebellion of 1745!

A Turnpike Act authorising the construction of a road between Harrogate and Boroughbridge having been passed in 1765, Metcalf obtained a contract for three miles of it, which he completed to the satisfaction of the Surveyor. For the next twenty-seven years he was almost continuously employed in making roads in Yorkshire, Lancashire and Derbyshire. In all he was responsible for over a hundred and eighty miles of highway, costing £65,000. He lived to be ninety-two years of age and died in 1810.

FIG. 30.—THOMAS TELFORD.

Telford and his work. An even more famous roadmaker than Metcalf was *Thomas Telford.* He was born in a remote Scottish village in 1757, and was apprenticed to a stone-mason. In 1782 he went to London, being employed on the building of Somerset House, and then to Portsmouth, where he was engaged on work for the Admiralty. He became road-surveyor in Shropshire, and constructed the Ellesmere Canal, which joins up the Dee, the Mersey, and the Severn, and the suspension bridges over the River Conway and the Menai Strait. But his most famous work was in Scotland, where, between 1803 and 1821 he constructed, at the request of the Government, 920 miles of road with more than 1,200 bridges. From a barren, poverty-stricken waste with few industries, the northern country became in a short time noted for its industries, its agriculture, the thrift and enterprise of its people. And for this thanks must be rendered to the mason who, by his own industry and skill became the most distinguished engineer of his day.

Macadamised Roads. The term "macadamised road" commemorates another Scotsman, named *Macadam*, who was a great advocate of good roads, and devised the method of making a durable surface with small stones, watered and rammed hard. Though some of his ideas were faulty, this gave the best surface for many years, and has only failed in recent times when traffic has become so much heavier.

Canals. But it was not only in regard to roads that improvements were made. Before Metcalf began road-making James Watt had spent much time surveying canal routes in Scotland, some improvements had been made in the navigation of the Yorkshire rivers Aire and Calder, and the *Duke of Bridgewater* had constructed, with the aid of *James Brindley*, a canal from Worsley to Manchester. The Duke was a wealthy man who had much coal on his estate at Worsley, and Brindley was a man with neither money nor education, but possessing great genius as an engineer.

Brindley's early life. He was born near Macclesfield in 1716, and was apprenticed to a wheelwright. At first he was unpopular both with his master and fellow workmen, and was regarded as a bit of a fool. His opportunity came when a mill which his employer was erecting in Macclesfield proved unsatisfactory, though it was supposed to be copied from a successful one at Smedley near Manchester. Brindley determined to ascertain what was wrong himself. One Saturday, as soon as his work was over for the day (and there were no half-holidays then), he set off to walk the twenty-five miles to Smedley. Arriving on Sunday morning he sought out the proprietor and asked to be allowed to inspect the mill. The request having been granted, he spent the whole day examining the machinery, and then started to walk back again. He arrived just as the men were starting work and was able to make the machinery at Macclesfield Mill work to everyone's satisfaction. This incident is typical of the man's whole career. He was a tremendously hard worker, he was thorough, and he would never be beaten. When the Duke chose Brindley to carry out his scheme no better man could have been found.

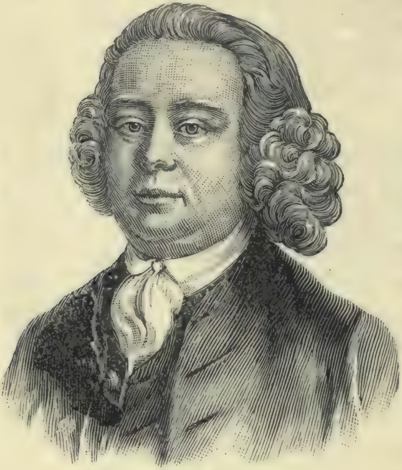

FIG. 31.—JAMES BRINDLEY.

Canal construction begins in earnest. The original *Bridgewater Canal* was completed in 1761, and the Earl almost immediately decided to carry the canal to Runcorn. Carriage by road between Liverpool and Manchester was then forty shillings a ton, and by water twelve shillings. The proposal to build the canal aroused bitter opposition, but the Duke triumphed, though the scheme nearly ruined him. The canal was opened in 1772, and the cost of carriage fell to six shillings a ton.

Effect of Canals. Canal construction was now attracting a good deal of attention. The advantage of cheap transport of raw materials for the expanding industries, and of food for the rapidly growing towns was clear to all. *Josiah Wedgewood*, the great Staffordshire potter, and his friends secured Brindley's services for the *Grand Trunk Canal* from Runcorn to Birmingham, and a few years later the Thames, Severn, Trent, and Mersey were connected by canals. The cost of carriage fell to one fourth, and the population of the towns increased at a great rate—Manchester from 41,000 in 1774 to 189,000 in 1821, and the Potteries from 7,000 in 1760 to 20,000 in 1785. The 350 miles of waterway constructed by Brindley rose to more than 2,500 before the accession of Queen Victoria, and were of inestimable service to British trade and industry.

QUESTIONS AND EXERCISES ON CHAPTER XII.

1. Whose business was it to construct roads and how were they paid for ?

2. At about what period did road-making revive in England?

3. Write notes on Metcalf, Telford, and Brindley.

4. Find out :

(*a*) The mileage of canals,
(*b*) The mileage of railways,

about 1837.

CHAPTER XIII

THE FACTORY SYSTEM

Change in Organisation of Industry—the Old Plan and the New. The steam engine, the textile inventions, the improvements in the manufacture of iron and steel, and the vast increase of trade which resulted from the construction of roads and canals, brought about great changes in the organisation of industry. At the beginning of the eighteenth century there were a large number of masters or men who worked for themselves, and a comparatively small number of men who gave their services in return for a weekly wage. Some of the masters employed several apprentices and journeymen; others none at all. The state of affairs was similar to that which exists to-day in the case of the carpenter, the plumber, the mason, the jobbing blacksmith and many other trades in which a man works for a small circle of customers in his immediate neighbourhood.

Spinning was, as we have already noted, carried on as a rule by women and children in country districts. They, almost alone, depended upon others for raw materials, but they possessed like most other workpeople of the time, their own tools and such machines as they required. Weaving was often done in sheds where one man employed several others. As one weaver could keep five or six spinners busy, the yarn had to be collected from a wide area, and there was some advantage in bringing it to as few centres as possible.

The tailor, the cobbler, the carpenter, the mason, the smith, and the wheelwright worked on commission. That is, they did not make things for stock, but to order. Sometimes the customer provided the material that was to be made up, and at others the workman provided it. When Brindley needed timber for a job, he went to a landowner and bought a tree, which he felled, cut into pieces of suitable size, and hauled them, with or without help, to his workshop.

The old relation between Master and Man. Where a man employed others to work for him there was much less difference in income, education and social position than there is to-day. It cost very little for a man to set up in business for himself, and as businesses were small, a large proportion of apprentices ultimately became independent workmen or masters on their own account. The rich men of those days were landowners, and merchants and lawyers who frequently became landowners. The merchant's whole object was to seize opportunity. He bought material or goods from people who were willing to sell cheaply, and he sold again to others who were willing to pay a good price. And in the days when communication was difficult and markets imperfectly organised, prices varied much more than they do now. The lawyer's chance of wealth came then as it does to-day, by rich men competing with one another for his services. On the other hand, the artisan, working only to order, generally undertook only what he had time to accomplish. The customer only came to him when the task was urgent; if he was unable to complete it within a specified time the customer went elsewhere.

Manufacturing on large scale, not entirely new. But it must not be understood that there was not, or never had been, manufacturing on a large scale. In the reign of Henry VII. "Jack of Newbury" had a clothing factory which employed a thousand hands, and though this was unusual, it had for centuries been becoming more and more difficult for men to set up in business for themselves. There was a tendency for the more thrifty and enterprising man to extend his business by employing others at a weekly wage. Those who accepted a journeyman's job were not all idle or thriftless. Men differ enormously from one another. Some are simple in their habits, and easily content; some shirk responsibility; some prefer to travel about from place to place, finding in variety and change ample compensation for a smaller income and a narrower life. The earlier manufacturers were not only enterprising, but they were frugal and hard-working men who lived very different lives from the rich merchants and lawyers of their time, or of their successors to-day. Dr. Aikin, writing of Manchester in the first half of the eighteenth century, says:

"An eminent manufacturer in that age used to be in his warehouse before six in the morning, accompanied by his children and apprentices. At seven they all came in to breakfast, which consisted of one large dish of water-porrage, made of oatmeal, water, and a little salt, boiled thick, and poured into a dish. At the side was a pan or basin of milk, and the master and apprentices, each with a wooden spoon in his hand, without loss of time dipped into the same dish, and thence into the milk-pan, and as soon as it was finished they all returned to their work."[1]

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[1] Quoted in Smiles's *Lives of the Engineers.*

Rate of change greatly increased by Mechanical Inventions. The rate at which the changes described occurred was greatly increased by the inventions of Kay, Hargreaves, and Arkwright. The new spinning machinery required power and added to the expense which a man must bear on setting up in business for himself. The machinery was more costly, and he had either to buy or hire a horse, or purchase or rent a water-wheel. But when once these were secured he could employ profitably more apprentices and journeymen than before. The merchant, the man of capital, already in some cases possessed the raw material which he handed out when he liked; the new employer, having obtained mechanical power had secured the tools of the trade, and handed out work as he willed. Capital, in the form of money, raw materials, and tools, had always been required in industry; the novelty lay in the fact that there was a greatly increased tendency for capital to be employed in a few big instead of in a large number of small lumps. When after 1782 the steam engine was applied generally, the change proceeded with such rapidity that it deserves the adjective 'revolutionary.'

Effect on Trade. The trade of the country grew enormously. Between 1781 and 1791 the amount of raw cotton imported increased by 319 per cent., and though this increase was not maintained, the figures show a large and continuous growth for many years. The steam engine demanded more coal and more iron, so that mine and workshop, foundry and forge, were hives of industry. All day long sounded the rattle and whir of machinery and the ring of steel on steel, while tall factory chimneys poured out vast clouds of smoke which blotted out the sun and enveloped the neighbourhood in a murky pall, in which it seemed there could be neither health, nor joy, nor happiness of any kind. To many people the grime and sordidness of the manufacturing town was one of the most terrible results of the industrial revolution. But, as we shall see later, there were worse happenings than appeared on the surface. And in any case there were compensations. From 1754 to 1815, we were intermittently at war with America or France. When Napoleon was seeking to put all Europe under his heel, Great Britain supplied his enemies with money and sent armies to the Continent to oppose his designs. In 1750 the National Debt was only £78,000,000; by 1784, at the close of the war with America, we owed £200,000,000; and in 1815 our obligations had risen to £800,000,000. In sixty-five years we had borrowed money and bought goods, for which we could not pay cash, to the tune of £722,000,000!

The National Credit. No other nation in Europe could have done this. Why were we able to do it? It was because we were wealthy; we could pay the interest and we should be able, sooner or later, to re-pay the capital. We had very little money, but we had coal and iron and well-equipped workshops and skilled mechanics. The Government was often intensely feeble, but the people were strong. We had a commanding position on the western edge of Europe, on the line of traffic between the old world and the new, and we had ships manned by sailors who were second to none in their daring seamanship. When Napoleon called us "a nation of shopkeepers" he forgot the sailors, as he forgot the men who toiled in the factory, the workshop, and the mine. The industrial revolution brought much evil in its train; but it saved the nation from bankruptcy, and it altered the course of history, not only of Europe, but of the world.

Questions and Exercises on Chapter XIII.

1. Write a short account of the organisation of industry at the beginning of the eighteenth century.

2. Write a short account of the Factory System.

CHAPTER XIV

THE CONDITION OF THE PEOPLE

Distress on the Land. While the manufacturers and the country as a whole became more wealthy through the reform in agriculture and the use of machinery and mechanical power, the people fared very badly. The new methods of cultivating the soil, and later, the attempts to improve the breeds of sheep and cattle led to the enclosure not only of the open fields, but also of the common land and meadow. Sometimes the enclosure took place by general agreement, but in most cases an Act of Parliament was required. When such an Act was passed Commissioners were appointed to see that it was carried out. Every man who claimed to own the land he held was required to prove his right to it. The Commissioners were not always just in their dealings with poor men, and many free-holders and lease-holders could not afford to fence and drain their holdings even when their claim was admitted. Thousands of the copy-holders had lost their "Copy"—the document which proved their title. Moreover, when the common land was enclosed they were deprived of the means of feeding their stock.

Necessity for Enclosure. The process of enclosure was encouraged by the necessity of feeding a rising population, and by the desire of the Government to have as much corn as possible produced in the country. Between 1700 and 1750 there were 112 Enclosure Acts and many examples of enclosures by agreement. But when the new industries began to develop from the middle of the century, the increasing industrial population rendered food production more and more necessary, and more and more profitable, when carried on in well-drained and properly fenced fields. So that in the sixty years from 1755 to 1810 there were more than 2,900 Enclosure Acts. By 1850 the open-field system had disappeared, and the English countryside took on the appearance it bears to-day.

The large farms were increased in number ; the small farms were diminished ; and the number of men working on the land for a weekly wage rose enormously. In 1688 it had been estimated that there were fewer than 17,000 large estates ; 160,000 free-holders, or "yeomen," as they were called ; 150,000 lease-holders and large copy-holders ; 400,000 cottagers, holding five acres or less ; and more than 360,000 squatters who had settled on a common, cultivated a small plot, and kept a few pigs and fowls. As a result of the change the yeomen almost entirely disappeared, the lease-holders, copy-holders, cottagers, and squatters became labourers or drifted into the towns.

Many of the men who were displaced had supplemented their earnings from the cultivation of the soil by breeding cattle and sheep, and by the sale of yarn spun by their wives and children. Both of these sources of income were swept away. The enclosure of commons deprived them of pastures, and the new spinning machinery required the work to be done in factories provided with mechanical power.

So much for the country ; let us now enquire what was happening in the towns.

Hardships in the Factories. Until the steam engine made its appearance the new factories were established on the hillsides where water-power could be obtained, and the work was done mainly by women and children. The masters were probably no better or no worse as a whole than the rest of mankind, and some of them were certainly kindly in heart and just in their dealings. But many were blind to everything but wealth, and careless as to the means of obtaining it. Labour in these outlying places was not easy to obtain, and they made arrangements to take pauper children from seven years of age as apprentices. They kept them in hostels, and provided food and clothing. But the children had to work twelve hours a day, the food often lacked nourishment, the clothing was insufficient, and the houses in which they lodged were comfortless and even filthy. An outbreak of scarlet fever in one factory in 1786 attracted the attention of the Manchester Board of Health ; a public outcry arose ; *Sir Robert Peel* the elder, himself an employer, took the matter up, and in 1801 Parliament passed the first *Factory Act*.

The First Factory Act. The Act dealt with Pauper Children only. It forbade apprenticeships under nine years of age, limited the hours of labour to twelve, and abolished night work. It required the factory to be white-washed and ventilated, and stated that the children should have new clothes once a year, that they should have some schooling, and that they should attend religious service.

The Second Factory Act. Eighteen years later—in 1819—a second *Act* was passed placing all children—pauper or otherwise—on the same footing. This extension was due mainly to enlightened employers like *Robert Owen* and Sir Robert Peel. But neither Act provided schools or any

Lord Shaftesbury connected with Sir Robert means by which Parliament could be assured that its commands were being obeyed.

Weavers worse off than Spinners. In spite of the fact that spinning was the first to become a factory process, the spinners were better off than the weavers. A great deal more cotton was spun, but as it was strong enough to displace linen for the warp, a great deal more was required for the same quantity of cloth. Moreover, a considerable export trade arose. In 1798 the value of the yarn exported was about £30,000, and seven years later it was more than £900,000. There was, therefore, little unemployment, and wages were not exceptionally low. But the hand-loom weavers suffered terribly. They were an independent body of men, accustomed to work for themselves, and they resolutely refused employment

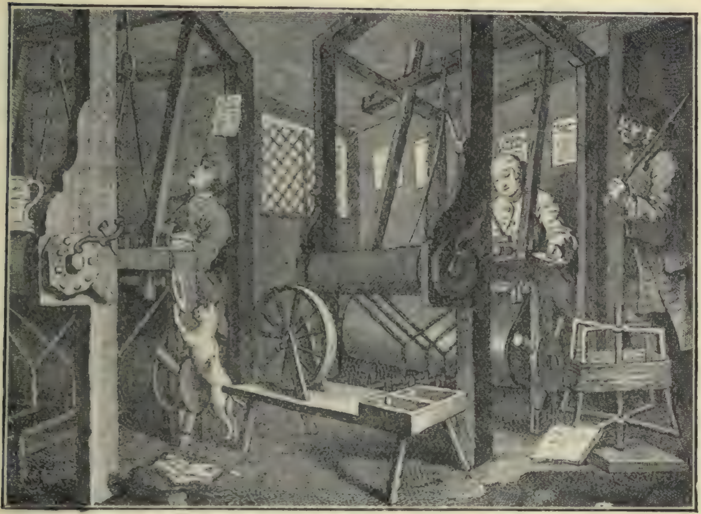

FIG. 32.—HAND-LOOM WEAVING IN THE EIGHTEENTH CENTURY.

in factories. The use of the power-loom made slow progress: in 1813 there were only 2,400 in use, and though in 1820 the number had risen to 14,000, the number of hand-loom weavers was still about 240,000. And as the power-loom could be, and was, operated by girls and women, each of whom managed two looms, the hand-loom weavers were forced to give in, or to emigrate. The price paid for weaving a particular kind of cloth, for example, fell from 29s. in 1797 to 6s. 6d. in 1827. So, finding that rioting and breaking up the new machinery was useless, the weavers emigrated.

General Unrest. The weavers, however, were not the only dissatisfied workmen, and the change from a system in which most men owned the tools and materials of their trade to one in which the tools and materials were owned by a few employers, was not accomplished without a struggle. Before the mechanical inventions had come into use, there was, as we have already noted, a tendency towards manufacturing on a large scale. During the first half of the eighteenth century there were frequent disputes about wages and conditions of labour, and the employers presented to Parliament many complaints about the attitude of their work-people. In the second half of the century these complaints became much more numerous. The work-people resented the new conditions and formed societies or *trade unions* to enforce their demands. There were many employers who were carried away by the money-making spirit of the age, and did not treat their employees fairly. But the complaints reached Parliament at an unfortunate time. The French Revolution in which the governing classes had been murdered wholesale, frightened people in England, so an Act rendering illegal all combinations to control wages was passed in 1799.

An Act against Combination. Though this Act prohibited combinations among the masters as well as among the men, it prevented neither. Both sides continued the struggle, but under unequal conditions. The men were numerous, and in their case secrecy was difficult to secure. The masters, on the other hand, were few, and could meet for various other purposes and make their arrangements without it becoming known.

The Act Repealed and passed in a modified form. The men found sympathisers in *Francis Place,* a master-tailor, and *Joseph Hume,* a member of Parliament, who were untiring in their efforts to obtain the repeal of what they felt to be an unjust law. When at last, in 1824, they were successful, trade unions sprang up in such numbers all over the country that employers became alarmed, and used their influence in Parliament to get the Act passed again. But this time combination for the purpose of regulating hours and rates of wages was not forbidden.

The Old Poor Law. The amount of distress during the eighteenth century also forced the Government to take action in another direction. The methods of providing Poor-Relief were based upon an Act passed in 1602, during the reign of Elizabeth. Under this Act workhouses had been provided, work was found for those who would work, relief for those who could not work, and punishment for those who would not work. Power was given to the Magistrates to collect subscriptions, to levy a rate, and to appoint overseers of the Poor. By an Act of 1723 no one could receive relief unless he performed a certain task in the workhouse. But in 1787, when distress was very prevalent, an Act known as *Gilbert's Act,* abolished the workhouse test, and empowered the Magistrates to give relief out of the rates wherever they thought it was needed. Eight years later the Berkshire justice set an unwise example by supplementing wages out of the rates.

Break down of the Poor Law. The result was disastrous. The farmer often paid the lowest wages he could and let the rest come from the public purse, and the labourers in many cases became idle and lost their spirit of independence. There was no encouragement for a man to act fairly, to do his best, or to be thrifty. It was State charity in its worst form—an expenditure of public money without any guarantee that it was really necessary or would be properly used.

Need for Electoral Reform. While vast changes in the methods of industry were thus giving rise to problems at home, the main efforts of the Government were directed to the prosecution of the War. When this ended in 1815 there was further trouble. Trade was bad, food was dear, and wages were low. Members of Parliament were elected by the same class of people as they had been in the Model Parliament of 1295. They represented country districts and decayed boroughs which had long since ceased to be of any importance, while the great industrial towns, which had sprung up during the last hundred years, were mostly unrepresented. There was a widespread feeling not only that the Government did not fairly represent the people, but also that it was incompetent and corrupt.

The agitation for reform was greatly assisted by the improved means of communication and by the growth of newspapers. The great merchant and manufacturing class more particularly were beginning to take a keener interest in current politics because it was less remote; and they demanded a voice in the government of the country. Finally they achieved their object in the passing of the first *Reform Bill* in 1832. The new Act deprived a number of boroughs of representation, and distributed the vacant seats over the industrial towns. It gave the vote to £10 householders in the towns, to £10 copy-holders, long lease-holders and certain others in the counties, and added half a million voters to the Register.

The Reform Parliament immediately passed two Acts which in the opinion of the new Members had too long been delayed. The *Poor Law Act* of 1834 required guardians to be elected, grouped parishes into unions, and practically made the workhouse task a condition of relief. It created effective machinery for administering the law; it relieved destitution when it occurred; but it did not prevent its occurrence.

The other Act, passed in the following year, established Borough Councils, which enabled the new towns to enter properly upon the duty of self-government.

The new Parliament, with its more representative character and liberal spirit, was the outcome of the inventions and improvements which have been described in the preceding chapters. Without these inventors reform would probably have come some time, but its arrival would have been enormously delayed. For several hundred years the country had been growing in power and prosperity, and its people had been enjoying a larger measure of freedom. But the steam engine turned a walk into a gallop, and many of the evils of the time were due to the fact that men could not see clearly in what direction it was leading them.

QUESTIONS AND EXERCISES ON CHAPTER XIV

1. What was the nature and what were the effects of the Agricultural Revolution of the eighteenth century?

2. When was the first Factory Act passed, why was it necessary, and what did it do?

3. Why was the action of the Berkshire magistrates, in supplementing wages out of the rates, unwise ?

4. What general causes led to the Reform Act of 1832 ?

5. Copy the chart called "Landmarks of the Industrial Revolution" on pp. 56-58, and add columns to show

(*a*) date of accession of the sovereign ;

(*b*) the political changes in the Government, *i.e.* Whig or Tory ;

(*c*) the Colonies or Dependencies acquired during this period.

PART IV

THE INDUSTRIAL REVOLUTION

2. THE NEW ERA IN TRANSPORT AND COMMUNICATION, 1820-1880.

LANDMARKS OF THE INDUSTRIAL REVOLUTION, 1832-1880

	Manufactures.	Facilities.	Political Events.
1830		First real Steamer crosses Atlantic. 1833. Electric Telegraph. 1837. First regular Atlantic Steamship Service. 1838. Telegraph on Railways. 1839.	Dorset labourers transported for taking the oath. 1834.
1840		First large Iron Steamship. 1843. Railway signals invented. 1846.	Railway Act. Coal Mines Act. 1842. Factory Act. 1845. Factory Act. 1847. Public Health Act. 1848.
1850	The Compound Steam Engine. 1850.	Dover-Calais Cable laid. 1851. Railway Signals improved. 1856. Privateering abolished 1856.	Coal Mines Act. 1850. Factory Act—first legal working day. 1850.

LANDMARKS OF THE INDUSTRIAL REVOLUTION—*continued.*

	Manufactures.	Facilities.	Political Events.
1860	Bessemer Steel. 1860. Siemens Open hearth Steel. 1860. Lenoir's Gas Engine. 1860.		Coal Mines Act. 1860.
		Atlantic Cable laid. 1866.	
			Second Reform Act. 1867. Factories and Workshops Acts. 1867.
1870		Government purchase Telegraphs. 1870.	Education Act. 1870.
	Otto Gas Engine. 1876.		Labour in Parliament. Compulsory Education Act. Merchant Shipping Act. 1876.
		Telephone invented. 1877.	
		Arc Lamp introduced. 1879.	Factory Acts consolidated. 1878.
1880		Incandescent Electric Lamp. 1880. Refrigeration and Cold Storage. 1881.	Employers' Liability Act. 1880.

CHAPTER XV

MANUFACTURES FROM 1820 TO 1880

In the eighteenth century the organisation of the Textile Industry and the Iron Trade had been revolutionised by the inventions which have been described in Chapters VIII. to XI., and during the sixty years from 1820 the new methods, involving the use of power and machinery, spread to many other manufacturing processes.

Progress of the Cotton Industry. The cotton industry did not alter much in character. Gradually the number of mills driven by water-wheels decreased, and the number driven by steam engines increased. In spinning, Arkwright's water-frame had been modified and called a *throstle-frame* because it sounded a whistling note when working. A further modification of this machine, called the *ring-frame*, was made in America in 1828, but did not come largely into use in England until after 1880. The spindles upon which the thread is wound in this machine make from 6,000 to 8,000 revolutions a minute, so that breakages are liable to occur; and the finest yarn was, and still is, spun on the mule.

Perhaps the most important invention in cotton machinery during this period was the *Heilman comber*. The fibres of the raw cotton are of different lengths or staple, and this machine combs out the shorter ones, which would be a source of weakness in the finest yarn.

It was of great importance to Lancashire, because the climate and exceptional skill of the operatives are particularly favourable to the spinning of fine threads.

It will be remembered that the hand-loom weavers had fought bitterly against the power-loom, and had even emigrated rather than consent to enter the factories.

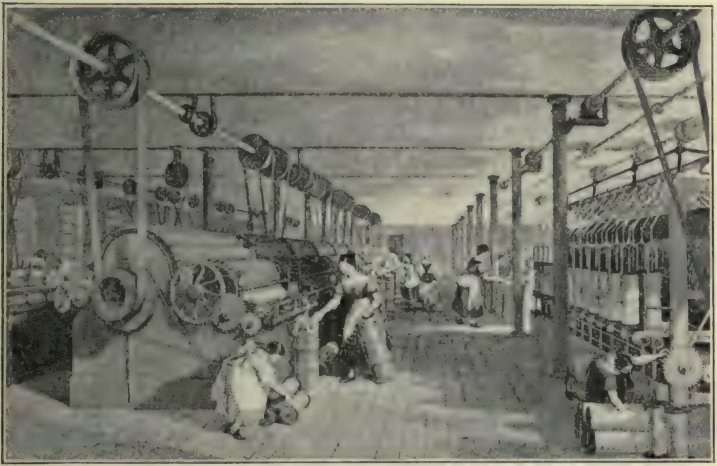

FIG. 33.—CARDING, DRAWING, AND ROVING IN 1835.
(From Baine's *History of Cotton Manufacture.*)

But it was a losing battle, and after 1830 the steam engine extended very rapidly in weaving sheds.

Developments of the Woollen Industry. From the cotton industry the use of power spread during this period to the manufacture of woollen yarn and cloth, and a great concentration of woollen mills occurred in the West Riding of Yorkshire, where coal was plentiful. But many of the West Country mills were kept going for many years.

Wool differs from cotton in the fact that old woollen cloth can be pulled to pieces, re-spun and used again either alone or in combination with new stuff. The old woollen rags which are used for this purpose are called *shoddy*. The process was discovered by Benjamin Law about 1800, and something like 100,000 tons of this material are now worked up every year in Dewsbury and the neighbourhood.

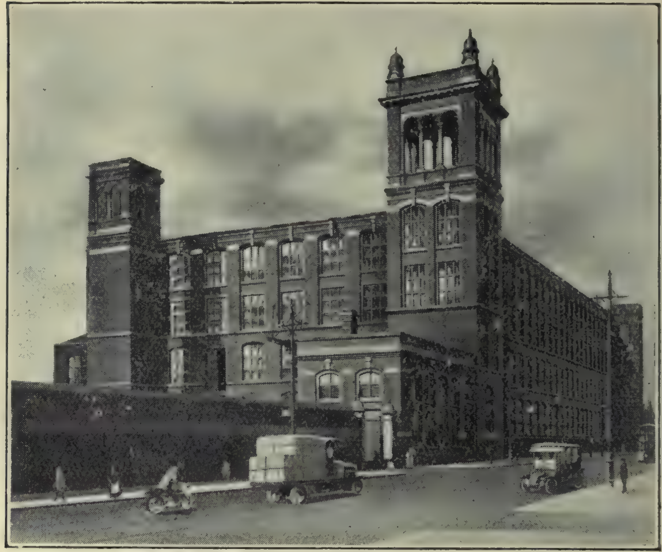

FIG. 34.—EXTERIOR OF A MODERN MILL.

The Hosiery Trade. Now if yarn or thread is woven it forms cloth, while if it is knitted it forms *hosiery*, which being light and porous is peculiarly suitable for undergarments. And as cotton, wool and silk are used for hosiery, the growth of spinning and weaving stimulated the hosiery industry. The original machine of William Lee, constructed in 1589, would knit a row of plain stitches only. The stocking was unshaped and had to be sewn up. Strutt, in 1760, had invented a machine that made ribbed hose, which were more elastic and gave a better fit. About 1860 a new machine enabled a stocking which did not require stitching to be knitted; and about the same time fancy stitches became possible. But power was not adopted until 1857. The hosiers paid the employer from 1s. to 3s. a week for the hire of a machine which they used at home. This system was not economical, it was sometimes conducted unfairly, and it was abolished in 1873.

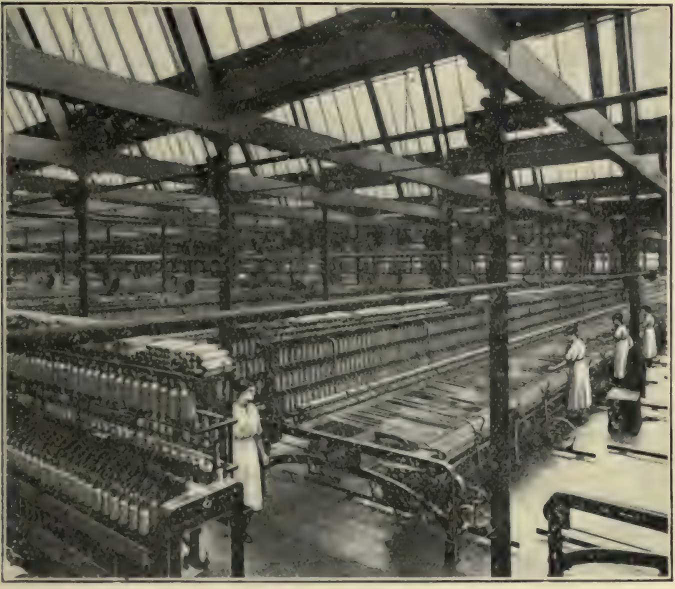

FIG. 35.—INTERIOR OF A MODERN MILL.

Machine-made Lace. Cotton, again, is required for making lace, which, up to the end of the eighteenth century, was made on a "pillow" by the slow and tedious process carried on in Devonshire villages to-day. Lee's stocking frame was adapted to lace-making in 1781 and greatly improved for this purpose by *John Levers* in 1813. This enabled patterns to be made. It was still further improved in 1837, and the industry grew up almost entirely in Nottinghamshire and Derbyshire. Though the development was slow it resulted in converting lace from a luxury which only the rich could enjoy to an article within the reach of the relatively poor.

Further improvements in the Manufacture of Iron and Steel: Hot-blast. Meanwhile there were four really important inventions connected with the manufacture of iron and steel. In the neighbourhood of Glasgow there was a deposit of blackband ironstone which was practically unusable because it could only be smelted with difficulty. It attracted the attention of *John Neilson*, manager of Glasgow Gas Works, who made many experiments with the object of finding a satisfactory method of recovering the metal. As a result he was led to the view that the blast of air, used to raise the temperature of the furnace, should be heated. This was contrary to the ordinary practice, and was laughed at when first proposed. But in 1828-9 he showed conclusively that by heating the blast to 300° Fah. the amount of coke per ton required per ton of iron was reduced from above eight tons to below five and a quarter tons. In consequence of his method the output of Scottish iron increased from 37,500 tons in 1830 to 475,000 tons in 1845. Neilson's invention not only rendered it profitable to smelt the blackband ores, but reduced the quantity of fuel required per ton of iron from any ore, and it is now very generally employed. The original method of heating the air by passing it through pipes in a furnace is now, however, replaced by one in which the hot gases which formerly escaped from the top of the furnace are used. Near every modern blast furnace will be seen two towers. In each of these is a "checker-work" of bricks. The air is passed through each of the towers in turn while the other is being heated by the waste gases.

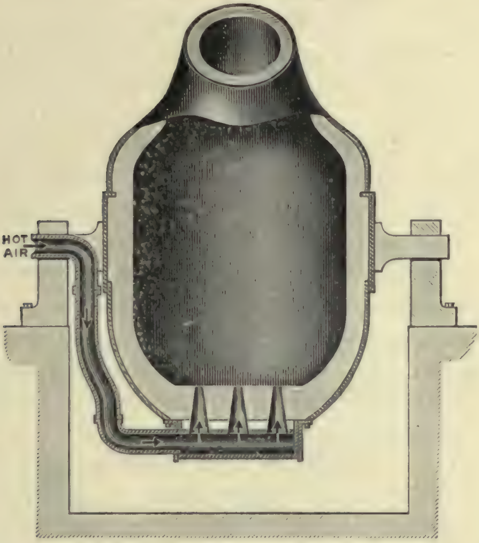

Fig. 36.—A Bessemer Converter.

The Bessemer Process. *Henry Bessemer's* process for the manufacture of steel was of even greater importance. It will be remembered that steel differs in composition from wrought and cast iron only in the percentage of carbon, and that in this respect it lies between the two. Huntsman had made it by adding carbon to wrought iron, but the process was slow and only small quantities, say, up to a hundredweight, could be prepared at a time.

It occurred to Henry Bessemer in 1856 that as not only the carbon, but also the other substances which were present in cast iron, would burn in oxygen, it might be possible to remove them by blowing air through the molten metal. He found that the heat produced by burning out the impurities was so great that instead of the metal being cooled by the air it actually became hotter and more fluid. A specially constructed vessel called a *converter* was used, and to-day ten or fifteen tons of steel can be made in half-an-hour from molten cast iron.

During the *blow* a flame, accompanied by showers of sparks, issues from the mouth of the converter. As the removal of carbon and other impurities becomes complete, the converter is rotated so that a quantity of molten metal, containing sufficient carbon to convert the whole into steel, can be poured into the mouth. The steel is then run into moulds, where it is cast into solid blocks called ingots, and these ingots are frequently taken straight to the mills, while still red hot, to be rolled into plate or rod or bar.

The real advantage of Bessemer's process lay in its cheapness. The speed with which it could be carried out was, in some respects a disadvantage. A very small difference in the percentage of carbon produces a great difference in the quality of the steel, and as some of the iron was oxidised it was difficult to know exactly how much molten "high-carbon" alloy must be added to produce exactly the percentage of carbon required. This difficulty was not present in the process invented by *Dr. William Siemens* about the same time.

The Siemens Process. In the Siemens process the cast iron is smelted on a hearth and the fuel used is gas. By properly adjusting the supply of air the carbon is slowly burnt out, and a sample can be removed from time to time by means of a small spoon at the end of a long iron bar, for testing in the laboratory. As the process requires a number of hours it can be stopped just at the moment when the carbon has been reduced to the desired percentage.

These two processes, and especially the Bessemer, provided the engineer with large quantities of a material which was stronger than wrought iron, but was suitable for practically every purpose for which that metal had formerly been employed. It replaced cast or wrought iron for rails, and gradually took the place of wrought iron for boilers. After 1874 the iron ship gave way before the steel ship, and all the great bridges of the world have been built with the same metal. The world of industry entered a new era—the age of steel.

Questions and Exercises on Chapter XV

1. Write short notes on the progress of the Textile Industry from 1820 to 1880.

2. Is there any iron furnace in your neighbourhood which uses hot blast ?
What is the output of the furnace annually ?

3. Write a short account of the various methods of making steel before 1880.

4. Remembering that steel can be cast in a mould, which is a cheaper process than forging, make a list of things which would be very much more expensive if only cast or wrought iron were available.

CHAPTER XVI

AGRICULTURE UNDER FREE TRADE.

A period of Distress. The Agricultural Revolution of the eighteenth century was practically complete by the middle of the nineteenth. The last remnants of the open-field system had disappeared, holdings had been "consolidated," and the separate strips replaced by compact farms dotted about the country as they are to-day. But in spite of the advantages of this system there was widespread misery and distress from the end of the Napoleonic Wars until Queen Victoria came to the throne in 1837. The amount of labour which was available was increased by the disbanded soldiers who had served in Wellington's army, so that wages were low. On the other hand, the crops were poor owing to a succession of wet seasons, rates and taxes were high, and many farmers could not afford to pay their rent.

Attitude of the Government. Moreover, the prosperity of those who tilled the land was threatened by a change in political policy. It will be remembered, first, that the policy of Tudor statesmen had been to keep up the price of corn, and when it was plentiful the Government had prohibited import or paid a "bounty on export." This means that they had paid so much a quarter[1] to the merchant on all corn sent out of the country so that the price to the foreign buyer might be low enough to attract him. The bounty, of course, varied with the price at home, because this rose or fell according to the quantity the farmers had to sell. Secondly, between 1770 and 1790 the home demand had exceeded the home supply so that there was none for export. From 1773, therefore, importation was encouraged whenever the home price exceeded a certain amount.

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[1] One quarter (8 bushels) of wheat weighs about 500 lb. or nearly 4½ cwt.

When the Great War cut off supplies from abroad, prices rose and fell with great rapidity. The normal price rose to eighty shillings a quarter, but this had to be lowered in the succeeding years of depression, and in 1828 a sliding scale was adopted by which the import duty varied with the price.

The demand for cheap Food. In the meantime political power was passing from the landowner to the merchants and manufacturers of the towns. These men wanted cheap food in order that they might pay low wages to their work-people, produce their goods at less cost, and increase their trade. To secure cheap food they began to agitate for the abolition of the *Corn Laws*.

These men were not necessarily acting on selfish motives. While trade was bad there was bound to be distress. Goods could be not produced cheaply while wages were high. And wages could not be lowered unless the price of food could be brought down.

A general principle behind the Movement. But behind this special argument there was a general theory like that which justified, or seemed to justify, the mercantile policy described in a previous chapter. The idea that it was better for everybody that all trade should be free from restrictions had been growing for a number of years. It had been put forward in 1776 in a learned book by *Adam Smith*, called "The Wealth of Nations," though it did not become a serious political question until nearly sixty years later. It was claimed that every man should be allowed to carry on his business in his own way—that if left to himself he would do the best for himself and the best for the country. The policy was called, therefore, *Free Trade*, or sometimes *laissez-faire*, which means "do as you please," though some people would say it meant "Every man for himself, and the Devil take the hindmost."

Of course, everyone did not hold these views, and there was a great struggle; but the manufacturers were in power and had their way. The Navigation Acts, which restricted shipping, were first modified and then finally swept away in 1849, while the Corn Laws were repealed in 1846.

Manufacturers benefit. The result—to the manufacturers—far exceeded their anticipation. British trade grew by leaps and bounds, British ships began to dominate every sea, and British goods flooded every market in the world. Free trade suited us because we were first in the use of coal for manufacture and transport. It suited us because, while we had peace at home, continental countries and America were ravaged by civil war. It was not, however, merely a Free Trade triumph, but a triumph of Free Trade together with industrial and political advantages which, by an accident of history, had happened together.

Agriculture did not at first suffer. At first, too, agriculture did not fare so badly. In order to improve their crops many landowners spent enormous sums in draining their estates, and after 1848 the Government lent money for this purpose at a low rate of interest. The Royal Agricultural Society, founded in 1838, did a great deal to obtain and distribute information to farmers, and the new railways not only reduced the cost of transport, but also enabled the farmer to get rid of his produce more easily.

More important still was the fact that great discoveries were being made on the relation of the plant to the soil. In 1840 the German chemist, *Justus von Liebig*, read a paper before the British Association for the Advancement of Science, in which was collected all the information then available on plant food. Again, *John Bennett Lawes*, who had started farming in 1835, when he was only twenty years of age, made many experiments, as a result of which he showed how to make bone-manure. He built a chemical factory at Deptford to make artificial fertilisers, and began a long series of experiments, both in plant growing and feeding of animals, at Rothamsted, which are still in progress to-day. The farmer was no longer dependent upon farmyard manure for maintaining the fertility of the soil. A number of new substances were rendered available, and the use of them not only gave him heavier crops, but enabled him to some extent to grow what he wanted independently of rotation, though, for the sake of economy, rotation must still be practised.

Effect of external affairs. While the British farmer was thus receiving scientific assistance, he was also aided in other ways. Thus, the Crimean War of 1856 closed the Baltic ports and prevented the importation of wheat from Russia, and, again, the war between North and South in America checked the supply from that country.

Three disasters. On the other hand, the outbreak of potato disease in 1844-5 was a terrible calamity. The potato had been introduced from America in the reign of Elizabeth, and had come to be the most important food of the poor. The greatest distress was produced in

Ireland, where a severe famine occurred, and many thousands had to emigrate in order to avoid starvation. Again, in the first half of the period the improvement in the breed of cattle and sheep, which had been made at the end of the eighteenth century, rendered the home supply of meat ample for the country's needs. The people were poor and could not afford to live very well. But with increasing prosperity the town artisan demanded a more generous diet, and it became evident that the native pastures would have to be supplemented from foreign sources. The position was rendered worse by the *rinderpest*, a disease which invaded England from Russia in 1865 and destroyed 200,000 head of cattle, and by an outbreak of *foot-rot* among sheep in 1878 which led to a loss of 3,000,000 animals.

At first the shortage was met by the importation of canned meat and of live cattle, until about 1880, when applied science rendered it possible to bring frozen meat from America and the Colonies so that it arrived in a fresh condition.

In spite of these misfortunes, however, the agricultural distress, which existed before 1837, was followed by a period of prosperity which continued until 1875. Beyond that date its history will be told in a later chapter.

QUESTIONS AND EXERCISES ON CHAPTER XVI

1. Why was there so much distress in the country between 1815 and 1837 ?

2. Explain briefly the terms "Corn Laws," "Laissez-faire," "Free Trade."

3. By what methods was agriculture improved after 1837 ? What external events aided the British farmer during this period ?

4. From what disasters did British farming suffer between 1860 and 1880 ?

5. At about what time did the home supply of meat fail to meet the demand ? What were the reasons for and what were the results of the shortage ?

6. Find out from books in a library :

(*a*) What substances must be available in sufficient quantity in the soil in order that good crops of the chief foodstuffs may be grown ; and,

(*b*) From what sources artificial fertilisers are obtained.

CHAPTER XVII

THE COMING OF THE RAILWAY

We have seen in Chapter XII. how the roads and canals encouraged the growth of trade by quickening and cheapening the transport of goods, and it is easy to see also that a limit would soon be reached beyond which further growth in this direction was impossible. For so long as the horse remained the best means of pulling a load neither load nor speed could be increased. New roadways could have been laid, new waterways cut, but they would not have made very much difference. If the new industries were to develop extensively beyond the stage they had reached in 1820 or 1830 the goods they produced must be distributed far more rapidly than they had been. And to this end men sought aid from the Steam Engine.

Pioneers. Among the earliest inventors who endeavoured to use steam as a source of power were some who thought of it mainly as a means of propelling vehicles along ordinary roads. The great scientific discoverer, *Sir Isaac Newton*, bent his mind to the problem early in the eighteenth century, and *Erasmus Darwin*, the physician and poet, was a great advocate of the use of Watt's invention for this purpose. The first practical steam carriage, however, was built by a Frenchman named Cugnot, in 1769, to haul cannon.

Watt took up the problem for a time and then dropped it, and his foreman *Murdoch* actually made a model. But all these attempts were directed to making an engine which would run on ordinary roads. No one at first seemed to think that the wheels would grip on a smooth rail, though tramways had been used for the wagons in iron-working districts in the seventeenth century. The earliest rails used for locomotives had teeth, and the wheels of the engine were provided with teeth to fit those on the rail.

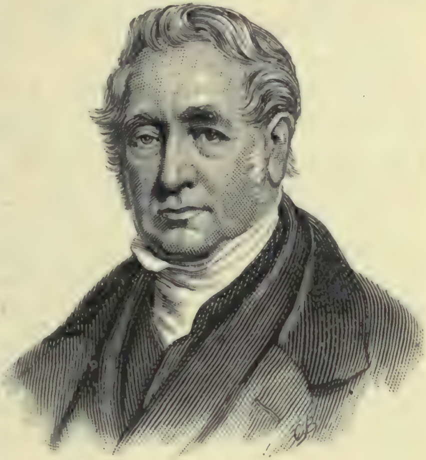

FIG. 37.—GEORGE STEPHENSON.

Introduction of smooth rail. In 1808, however, *Richard Trevithick*, a Cornishman who had made many experiments, built a circular railway in London and ran a locomotive on it at twelve to fifteen miles an hour.

George Stephenson's early life. After Trevithick's success, several steam railways or rather tramways were built in the north of England—notably at Wylam and Leeds, and the fact becoming more generally known attracted the attention of *George Stephenson*. Born in June, 1781, at Wylam, near Newcastle-on-Tyne, George Stephenson was the son of a colliery engineman. At an age when most boys now are not half-way through their school-days he was engaged to look after the cows on a farm near his home, and spent his spare time in making models with the aid of a pocket-knife.

When he was old enough he started work at his father's pit, and feeling his need of education attended a night school. Not until he was nineteen could he write his own name. Meanwhile he worked hard, studied, or mended boots, or repaired watches in his spare time, earned steady promotion, and in 1812 was appointed engineman at the Killingworth Colliery at £100 a year.

His first Locomotive. In his new post he soon began to introduce improvements. One of the first was a self-acting incline in a pit, by means of which the loaded wagons running downhill drew the empty wagons uphill, and reduced the number of horses required from a hundred to sixteen. His next idea was to draw the wagons along the tramway from the pit-mouth to the quayside by means of an engine. Lord Ravensworth, the owner of the pit, advanced the money, and his first engine, constructed in 1814, hauled thirty tons of coal up an incline of 1 in 450, at a speed of four miles an hour. Finding that it was difficult to produce steam fast enough for the engine, Stephenson fixed the exhaust pipe in the chimney. This increased the draught, caused the fire to burn more fiercely, and overcame the defect. But after a year's working he found that the engine cost as much as horses. During the next two years, however, he made such improvements that some of the engines constructed in 1816 were still in use forty years later.

The first Railway. The experience and the success which Stephenson had obtained gave him a reputation in the locality. He constructed the Hetton Colliery Tramway, in which locomotives were used on the levels, and in 1821-5 the Stockton and Darlington Railway. On the day of the opening ceremony his engine, "The Locomotive," hauled six wagons loaded with coal and flour, a coach containing the directors and their friends, twenty-one wagons with seats for passengers, and six more wagons filled with coal, at a speed of twelve miles an hour.

The first railway proper to be constructed was between Liverpool and Manchester. Valuable as had been the Bridgewater Canal in improving transportation between the two towns, it had failed entirely to keep pace with the demand. At Liverpool the quays were piled high with merchandise, the canal was full of barges, and transport by road was so slow and expensive that the proposal to construct a railway seemed to be the only way out of the difficulty.

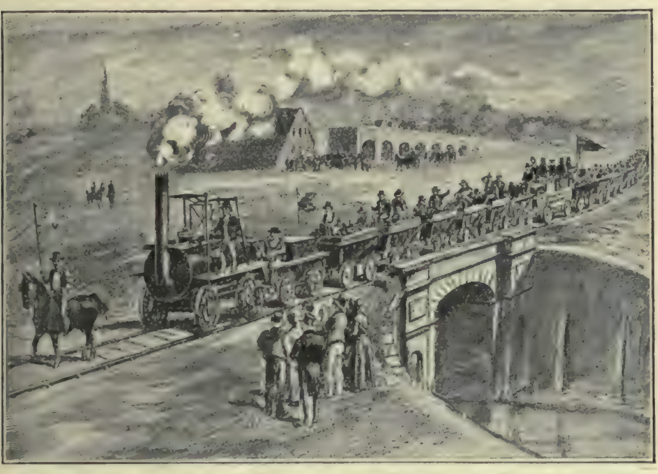

FIG. 38.—OPENING OF THE STOCKTON AND DARLINGTON RAILWAY. 1825. (From a contemporary print.)

Opposition to the Liverpool-Manchester Scheme. A Company was formed, Stephenson was appointed engineer, and then began a long and bitter fight against opposition. Speeches were made against it at public meetings, clergymen preached sermons against it, landowners and farmers threatened to use force if the engineer or his surveyors set foot on their land, and writers in the newspapers and in magazines poured scorn upon the proposal.

The Bill authorising the construction of the line was thrown out by the House of Commons. One of the objections arose from the fact that the plans showed the railway crossing Chat Moss, a four-mile stretch of treacherous bog upon which even a man dare not venture unless he had broad pattens fixed to the soles of his boots to prevent him sinking into the soft surface. Stephenson had proposed to drain the track by cutting ditches on each side, and Mr. Alderson, one of the counsel for the opposition, spoke scornfully of the idea of "cutting impossible ditches at the side of this impossible railway."

Other people objected to the smoke and flame which would issue from the chimney. One man suggested that the chimney would be red-hot and would frighten the cows. Stephenson asked how the cow, or "coo" as he called it, would know that it was not painted! Another asked what would happen if a cow got on the line. "Would that not be bad?" he enquired. "It would," said Stephenson, "for the coo"!

A new survey and a fresh Bill. After the rejection of the first Bill a new survey was made—still across Chat Moss—a fresh Bill was prepared, and this passed the House of Commons by eighty-eight votes to forty-one, while in the House of Lords only two votes were recorded against it. Work was commenced in 1827. Chat Moss gave trouble at first, but was conquered more cheaply than had been expected, and the line was opened in 1830. Until the last moment it was doubtful whether steam engines would be used, but Stevenson persuaded the directors to offer a prize of £500 for the best engine.

There were four entries, but his own engine, "The Rocket," won easily. Unfortunately, on the day of the opening ceremony Mr. Huskisson, a famous statesman, was knocked down by one of the trains and died within a few hours.

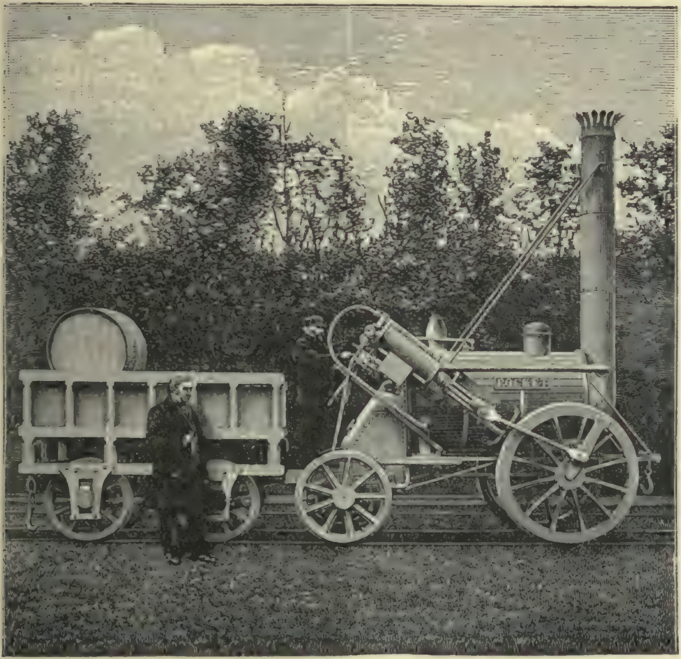

FIG. 39.—THE "ROCKET." 1829.

In spite of this accident no one doubted now that the steam locomotive had come to stay. Railways were demanded by all the larger towns, though some of the older ones which prided themselves on their long history or on their respectability, petitioned Parliament to keep the new-fangled notion outside their boundaries.

The great lines established. All the principal lines in the country except the Great Central were built between 1833 and 1862, and for most of them George Stephenson or his son Robert was the engineer. The London and North-Western Railway began with the London and Birmingham line, which, under the direction of Robert Stephenson, occupied 20,000 men for five years. The Great Western, built by *I. K. Brunel* between 1838 and 1841, was the only one to have the rails seven feet apart. On all the other lines the gauge was that originally adopted by George Stephenson—four feet eight and a half inches, and between 1869 and 1892 the Great Western Line was altered to match the others.

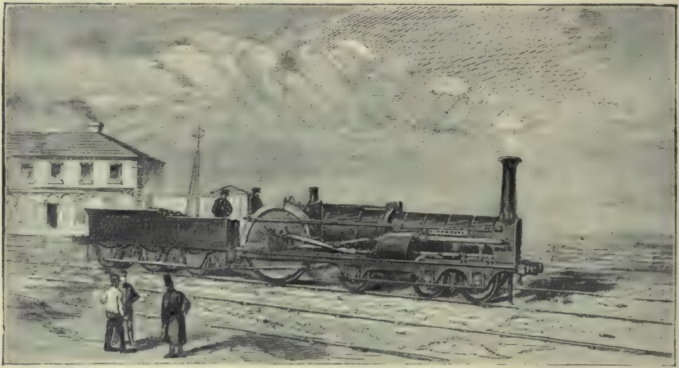

FIG. 40.—MANCHESTER AND LIVERPOOL RAILWAY.

The Railway boom. The railways were immediately successful, though to the surprise of those who had promoted them, the passenger traffic rapidly became more important than the carriage of goods. The dividends in 1836 were from 10 per cent. to 15 per cent., and this led to all sorts of mad-cap schemes being proposed. Parliament was flooded with Bills for railways all over the country, though very few of these would have paid to construct, and, as it was, many people lost money. The " boom " reached its height in 1845, and after that gradually subsided.

Improvements in signalling. It will be easy to see that speed and safety required quick and reliable methods of signalling. Before 1840 this could only be carried on by semaphore, or flag-wagging, in the day-time, and by the use of coloured lamps at night. But in 1839 the electric telegraph was used between Paddington and West Drayton, and four years later extended to Slough. In 1845 a man committed a murder at the latter place and escaped by train to London. The telegraph was put into operation, and when the murderer stepped from the train at Paddington he found detectives on the platform waiting for him. While the telegraph was useful in sending messages—for example, to advise a station of the approach of a train, a better method of conveying instructions to the engine driver was required. This was provided by the invention of *Charles Gregory* in 1846 of mechanical signals to replace flag-wagging. They were much improved by *John Shaxby* ten years later.

FIG. 41.—ROBERT STEPHENSON.

Effect on trade. With these advantages the speed and regularity of trains increased, and people who had formerly opposed the railways were converted. Internal trade grew because goods were conveyed more quickly and cheapened. External trade, again, grew because more raw materials, like cotton, were required, there was an increasing demand for manufactured goods on the Continent, in America, and the East; the railways fed the ports and the ports fed the railways.

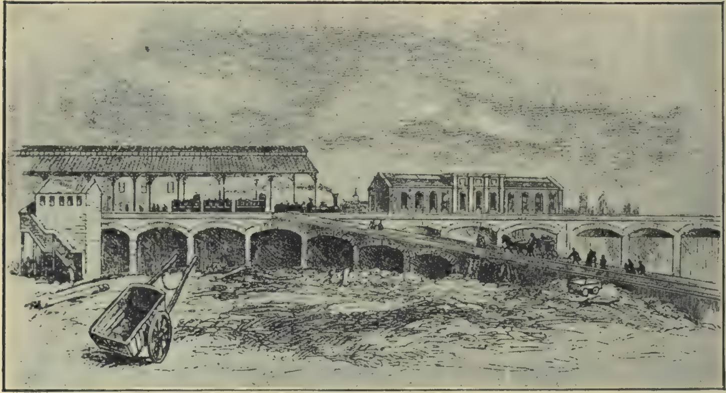

FIG. 42.—WATERLOO STATION AND ENGINE HOUSE, LONDON. 1848.

The Penny Post. The new means of transport was immediately used for carrying letters, and the penny post was established in 1840. Both for business and private purposes, and not less for effective government, the quick delivery of messages was an enormous advantage over the slow stage-coach or the special messenger on horseback.

Railway legislation. Parliament soon decided that the railways must be regulated. They performed a public service, but that was all the more reason why there should be laws both to protect them and to protect the public.

Railway Acts do three things:

(*a*) They prevent the Companies from charging too much for the services they render;

(*b*) They require the Companies to take precautions for the safety of the travelling public, and of their own employees, and for the security of the goods they carry; and

(*c*) They impose penalties upon the public for disobeying the Bye-Laws which the Company have made for the proper working of their line.

The principal Act during this period was that of 1842, which required the Companies, among other things, to provide a sufficient amount of accommodation at a penny a mile. The word "Parliamentary" often seen on third-class tickets refers to this requirement. The Companies were also forbidden to give preference by special rates or otherwise to any trader in the Railway and Canal Act of 1854, and the Act of 1871 made it necessary for the Company to notify all accidents, and for the Board of Trade to hold an enquiry when one occurred. Again, under the Act of 1873 an arrangement was made by which traders could appeal against charges for the carriage of goods which in their view were excessive.

QUESTIONS AND EXERCISES ON CHAPTER XVII

1. Look up the life of George Stephenson in a Library and write an essay on his early years.

2. Set down briefly the steps taken by George Stephenson in the development of the railway up to 1830.

3. What difficulties faced the early railway builders? Compare these difficulties with those of railway building to-day.

4. Draw a graph showing the increase in railway mileage between 1830 and 1880. The figures will be found in Mulhall's "Dictionary of Statistics."

5. What improvements were made in railway working between 1830 and 1880?

6. In what way are railways controlled by the State?

CHAPTER XVIII

THE ELECTRIC TELEGRAPH

The three great forces of the nineteenth century were the railway, the steamship and the electric telegraph. Separately, each would have had a wonderful effect in altering habits of life and the relations of man to man; but, coming together, they remoulded the manners and customs of the civilised world within fifty years.

Early Knowledge of Electricity and Magnetism. Before 1800 hardly anything was known of electricity and magnetism. The mariner's compass had been known to the Chinese and had been introduced into Europe by the Arabs in the Middle Ages. Then the learned *Dr. Gilbert*, who was physician to Queen Elizabeth, collected all the information available, and wrote a book about it. Again, in the eighteenth century *Benjamin Franklin* proved the identity of lightning and electricity, and *Galvani* and *Volta* added greatly to our knowledge of the subject.

The foundation of the electric telegraph lay in the discovery by *Oersted* in 1819 that if an electric current was passed along a wire, a magnetic needle in the neighbourhood was turned to the left or right according to the direction of the current. Some years later *Ampère* suggested that this fact might be used for sending messages, but no one seems to have thought it worth while to make the attempt until after Faraday made his great discoveries between 1830 and 1832.

Invention of the Electric Telegraph. Then *Cooke* and *Wheatstone* in England and *Morse* in America invented telegraphy independently of one another in 1837, the year in which Queen Victoria came to the throne. Cooke and Wheatstone used a needle, or at first several needles, which were turned to the right or left by altering the direction of the current at the sending station.

FIG. 43.—SIR CHARLES WHEATSTONE.

Morse, on the other hand, used an electromagnet and a bar which was attracted or repelled according to the direction of the current sent through the line. The Morse "tapper" or "sounder" or "key" has gradually replaced the needle instrument except for certain work on railways.

The commercial use of the new methods of signalling was encouraged

FIG. 44.—SAMUEL MORSE.

when Steinheil discovered accidentally in 1838 that the earth could be used instead of a return wire. Since only one wire was required between two stations this meant a great saving of metal and much reduced the cost.

Telegraph Companies. The use of the telegraph on the Great Western Railway in 1839 has already been mentioned, and it was rapidly adopted on all the other lines. Many companies sprang up all over the country to provide services for the general public. In 1850, for example, the Electric Telegraph Company had about 1,500 miles of line, and all the more important towns were joined up. Sending a telegram, however, was rather a luxury. A short distance message was five shillings a word, and the lowest charge between Edinburgh and London was twelve shillings. But a strong feeling was growing up that the telegraph system was not a local but a national concern—that it should not be in the hands of private individuals but of the State.

Nationalisation and cheap Telegrams. In 1870, therefore, the Government bought up all the companies, established a national service, and made a fixed charge of one shilling for twelve words, the address being transmitted free. In 1885 this was altered to sixpence for twelve words including the address, and during the Great War 1914-8 the charge was raised to ninepence.

Submarine Cables. While the telegraph system was being extended on land great efforts were being made to lay cables under the sea. The discovery of the peculiar properties of gutta-percha about 1844 provided a material for covering the wires, which had to be "insulated" so that the electricity could not leak away. Dover and Calais were connected at the second attempt in 1851. But a transatlantic cable was a much more difficult task. An attempt was made in 1857, but a breakage occurred 380 miles from the Irish coast in 2,000 fathoms of water. Grappling irons were used, but only fifty miles of the cable were recovered. In the following year two ships, the Agamemnon and the Niagara, started from the middle of the Atlantic, steaming in opposite directions and paying out cable as they separated. Three times the cable broke, and when it was finally joined up it broke after it had been in use a month.

When a new attempt was made in 1865 the giant steamship, the Great Eastern, which had been built by I. K. Brunel, and was as large as many Atlantic liners to-day, was employed on the work. Failure did not destroy confidence, while it yielded experience, and in 1866 Great Britain and America were placed definitely and finally in communication.

Since that year submarine cables have been laid under every ocean in the world except those which surround the ice-clad poles ; and provided that the line is clear, all important towns are in almost instantaneous touch with one another. Time and space, which were formerly barriers between men in remote parts of the earth, have been destroyed, and all peoples have been brought more closely together.

QUESTIONS AND EXERCISES ON CHAPTER XVIII

1. Give a brief explanation of the way in which a simple telegraph instrument works. Look the matter up first in a Library.

2. Why was it desirable that the telegraph service should be " nationalised " ?

3. Look up the subject in a Library and then write a short account of the Atlantic Cable.

CHAPTER XIX

THE GROWTH OF THE STEAMSHIP

Early Steamboats. While the railway builders were weaving a network of iron roads over the land, other men were busy applying steam to the propulsion of the ship. Like the early inventors of the locomotive they did not wait until the engine was a perfect machine, but they had no success until after James Watt had patented his rotary engine in 1782. Five years later a man named Fitch constructed a steam-boat which moved through the waters of the Delamere by the aid of paddles like those of an Indian canoe ; and, again, in 1801, Lord Dundas and an engineer named Symington launched the Charlotte Dundas, which was a step in advance.

The Comet. But the Comet, built by *Henry Bell* in 1812, was the first passenger steam-boat in Europe. It was 40 feet long, 10½ feet beam, and was propelled by two paddles on each side. The engine was of three horse-power—not so powerful as the engines of many motor bicycles to-day. Three times a week for a number of years the little vessel puffed up and down the Clyde between Greenock and Glasgow, a distance of twenty-four miles.

The Clermont. The honour of constructing the first real passenger steamship, however, belongs to *Robert Fulton*, an American, who was originally an artist.

About 1793 he turned his attention to engineering and made many experiments on the resistance of different shapes of vessels when towed through the water. Having purchased a Boulton and Watt engine he took it to America and launched the Clermont on the Hudson River in 1807. This vessel was 133 feet long and $18\frac{1}{2}$ feet wide, and it made regular journeys from New York to Albany, a distance of one hundred and fifty miles, in about thirty hours. Wood was used for fuel, and country people who saw it for the first time speeding up the river in the darkness, with flame and sparks issuing from the chimney, wondered what new monster had come to vex the world.

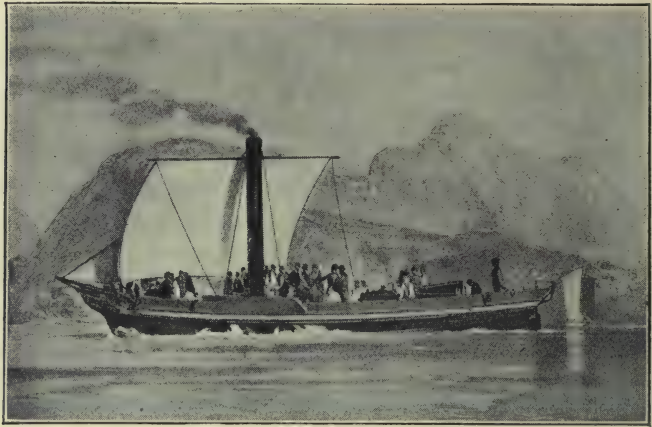

FIG. 45.—"THE COMET," 1812.
(From a contemporary print.)

The success of Fulton and Bell led to many steamers being built both in England and America, and by 1823 there were no fewer than three hundred plying on the inland waters of the latter country. From England the Caledonia made a voyage from London to Rotterdam and thence to Coblenz in 1817, and by 1820 there were regular sailings between Holyhead and Dublin, Greenock and Belfast, and Dover and Calais.

First crossing of the Atlantic by steam. Having mastered wind and tide in the narrow seas, men next cast their eyes upon the broad Atlantic. But at first they did not trust wholly to the new machinery. The Savannah, which left the town of that name on May 22nd, 1819, and reached Liverpool on June 19th, used her paddle wheels for only eighty hours. When first sighted off the coast of Ireland on June 17th, the smoke issuing from her funnel created the impression that she was on fire, and the revenue cutter, Kite, hastened to her assistance. The commander of the Kite was not a little astonished to find that he could not overtake a vessel

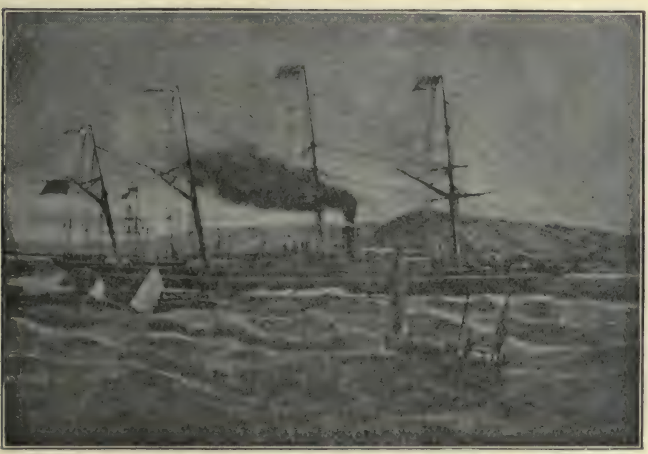

FIG. 46.—THE "GREAT WESTERN" PASSING PORTISHEAD, NEAR BRISTOL, ON HER FIRST VOYAGE TO NEW YORK, 1838.

Length 236 feet, width 35 feet, depth 23 feet. Registered tonnage 1320. Two engines of 200 horse-power. (From a contemporary print.)

that had no sails set, and did not discover the reason until he had caused the Savannah to heave-to by firing a shot across her bows.

The first vessels to make the whole voyage under steam were the Sirius and the Great Western. The Sirius, of 700 tons, crossed from Queenstown to New York in nineteen days, and the Great Western, of 1,321 tons,

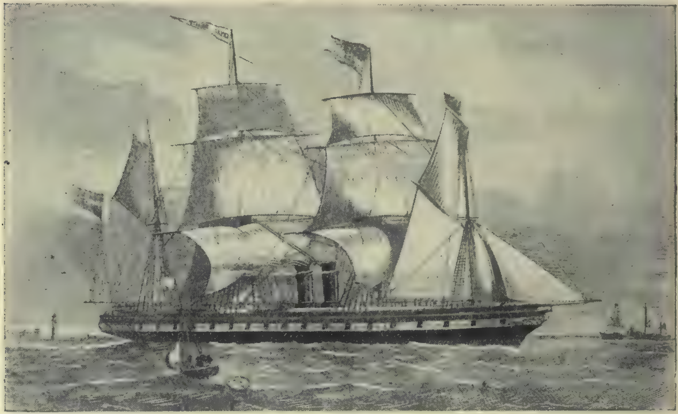

FIG. 47.—S.S. "GREAT BRITAIN."

wrong

completed the passage from Bristol to New York in sixteen days. Both these voyages were made in 1838.

Iron Ships. From this stage the Transatlantic steamship service developed rapidly. The British Queen, one of the most famous vessels of the period, was built in 1839, and the Cunard Company began with four ships in 1840. These were the last important steamships to be built of wood. Iron had been used for smaller vessels as early as 1821, but the first large iron steamship was the Great Britain, launched at Bristol in 1843. In September, 1846, she ran ashore on the coast of Ireland

first Steamship

1833 The royal william a Canadian
Steamship went all the way from

and remained exposed to the most terrible weather for eleven months before she could be re-floated and repaired. A wooden ship would have gone to pieces under those conditions.

The advantage of iron, however, lies in the fact that a wooden ship will carry about its own weight of cargo, while an iron ship will carry twice its weight. For an iron ship can be made longer than a wooden ship without danger of breaking its back, and as the length can be increased without a corresponding increase in the power required to drive it at the same speed there is additional space in which to store cargo.

Screw propeller introduced. The Great Britain was driven also by a *screw propeller* instead of paddle wheels, though this did not come into regular use until the sixties. The paddles and their boxes are rather awkward things when entering or leaving dock, and are liable to be damaged.

Growth in size, speed and power. The increase in size, speed and power of fast passenger steamers is well illustrated by those of the Cunard Company shown in the table below :

	1840	1862	1879
Length in feet - -	207	326	430
Displacement in tons -	1,154	2,539	4,808
Speed in knots - -	8·5	13·9	15·5
Horse-power - -	740	2,250	5,300

Thus within forty years the length was doubled, the displacement more than quadrupled, the speed doubled, and the power increased nearly eight-fold.

The struggle with America. During the first half of the century the Americans had a great advantage over the British in shipbuilding. Very little was done to improve the British sailing ship, and timber was scarce.

The Americans, on the other hand, were far more enterprising, and they had vast forests which were almost untouched. When the Navigation Acts, under which British goods must be carried in British ships, with masters and three-quarters of the crew also British, were repealed in 1849, the outlook for British shipowners was black indeed. The American clippers had entered the trade with China and the East, and they outsailed the British ships wherever they met them.

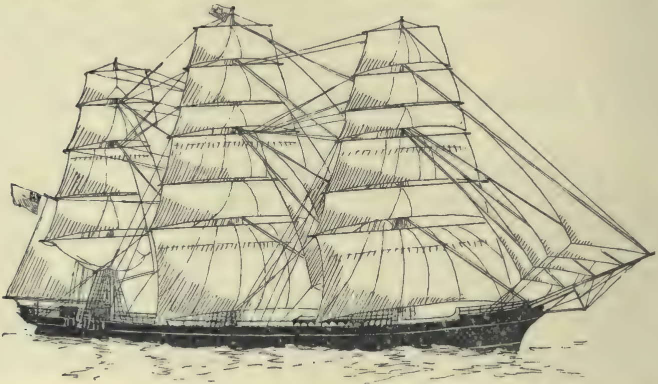

FIG. 48.—SAILING SHIP (CLIPPER).

The Steamship wins. After the first panic British shipbuilders themselves began to build fast sailing vessels with the huge spread of canvas which was the fashion of the Americans, and in the sixties, when the Northern and Southern States were at war, they began to recover lost ground. But the use of iron and steam turned the scales definitely in our favour. The American iron and coal industries were later in development, and the early use which the British had made of these natural resources gave them a supremacy which was unrivalled until the great War. Moreover, the opening of the Suez Canal in 1869 provided a short cut to the East, and destroyed all the advantage of position which had been enjoyed by the western sea-board of America.

QUESTIONS AND EXERCISES ON CHAPTER XIX

1. What were the principal vessels propelled by steam before 1830?

Put your answer in the form of a table showing as many particulars as possible.

2. What is the advantage of an iron over a wooden ship?

3. What were the Navigation Acts?

4. Give a short account of the struggle between British and American shipping in the middle of the nineteenth century.

Why did the British win?

CHAPTER XX

INDUSTRIAL COMBINATION

THE use of machinery and power had rendered it necessary for those who wished to engage successfully in the new industries to have a great deal of capital. Capital does not consist merely of money. It may be in the form of buildings, machinery, tools, raw material or almost any of the things needed in industry. But money is needed in the first instance to purchase or rent these.

Partnerships and Joint Stock Companies. In the eighteenth century if a man needed money to establish or extend a business he took a partner and each shared the gains or losses according to the amount of his contribution. In a number of cases, however, he organised a *Joint Stock* company to which many people subscribed; but the management was in the hands of only a few, and if the company failed those who had contributed were often called upon to pay sums many times greater than the amount of their contributions. Parliament endeavoured, therefore, to suppress these companies by the Bubble Act of 1719.

Limited Liability. Nevertheless they continued to grow, and it was found advisable to regulate what could not be prevented. From 1834 onwards Acts were passed which laid down the conditions under which Joint Stock

Companies could be formed, and in 1862 the Government gave them the privilege of *limited liability* on condition that they published at certain intervals some information about their affairs.

"Limited liability" means that in case of failure each shareholder will not be required to pay more than the amount of his share.

Under these conditions Joint Stock Companies flourished, and the old "unlimited" Company practically disappeared.

The new Relation between Employer and Employee. Now the Manager of the new type of company was not directly the employer. He was a servant of the shareholders, who expected him to produce the highest possible profits by any means at his disposal. As they did not come into contact with the work-people themselves they were not much concerned whether the hours were too long or the wages too low or the factory unhealthy. They had put their money into a company to get profit, and profit was all they required from the Manager.

The Power of the Company and the Weakness of the Workman. The big companies, possessing all the power and machinery and tools and material required to carry on the trade, were very strong, and the individual workman was very weak. The Manager of a factory or mine employing five hundred work-people could do without one or even a dozen of them. But the one or the dozen could not do without the labour which the factory or mine provided. If men refused the wages which were offered to them, or declined to work the number of hours required, they had to starve or go to the workhouse.

The Methods of Trade Unions. So in opposition to "combinations of capital" arose "combinations of labour"—the trade unions which were mentioned in

Chapter XIV. The principle upon which they worked was as follows: In order to carry on industry, land, capital, labour, and ability or organising power, are required. For these the employer pays rent, interest, wages, and salary. If any one of them is scarce more money has to be paid for it, and the trade unions sought to make labour scarce by means of a strike. If the employer was unwilling or unable to yield to the demand, and could secure other men in place of those who refused to work, then the strike could be broken.

The Strike and the Lock-out. Very often the employer *was* able to obtain men from other towns, and to prevent this the unions became amalgamated so that they covered all the principal towns in the country. It was then more difficult to secure fresh men because members of the unions were loyal to one another. The employers then tried to break the unions by refusing to employ any man who was a member. At the same time if a strike occurred in one place they locked the men out elsewhere. This increased the cost of a strike to the unions and prevented the men from holding out so long.

During the first half of the period—until about 1850—there was a great deal of trouble. Faults existed and mistakes were made on both sides. The men were not always moderate in their demands, and they were sometimes violent in their actions, while many employers held that they had a right to pay as low a wage as they could, whatever poverty and hardship the man and his family had to bear.

Trade Unionists under a Disadvantage. The facts that meetings of the unions were held in secret, with an elaborate ceremony, and that an oath was taken, rendered them objects of suspicion. Action could not be taken against them under the Combination Laws, but secret meetings of men who were bound to one another by an oath were illegal under the Conspiracy Acts, and in 1834 six Dorsetshire labourers were arrested and sentenced to seven years' transportation merely for taking the oath. This was an extremely harsh sentence.

The position was very difficult. Trade was bad and there was much misery and distress. In accordance with the political ideas of the time, the masters objected to the action of the unions and demanded the right to manage their own affairs in their own way. The men thought that by limiting the number of apprentices, smashing machinery, and abolishing overtime, they could improve their position. Neither seemed to realise that the steam engine had created a new world, in which new methods were necessary.

A new Policy. After 1850, however, there was a change. Some of the unions began to employ legal assistance, some established newspapers and the more important adopted moderate methods. Instead of concentrating their efforts against employers they sought to establish a recognised legal position, and acted as friendly societies. Their funds were devoted mainly to the provision of benefits to those of their members who were sick, or for other reasons were out of employment. Much less was heard of the objections to machinery, overtime, and apprentices than before, and in this way the unions overcame much of the suspicion and distrust with which they had been regarded twenty years before.

A legal Disability and its Removal. Then, in 1867, a great misfortune befell them. The Law Courts decided that the Boilermakers' Society could not sue the treasurer of one of their branches who had embezzled money. It was evident that English law did not recognise Trade Unions; it did not protect them, and their funds were not safe. At once a great agitation was begun to secure an alteration, but it was not until 1875 that this was obtained. The advantage, however, came too late to be of much service. For the next ten years trade was poor, there was much unemployment, and all efforts to raise wages and improve the standard of comfort were unsuccessful. When employers were prosperous and were in need of labour they were not as a rule unwilling to listen to the men's arguments ; but in hard times they had, or thought they had, more reason to refuse. And when the Trade Union movement revived in the eighties it had a new policy.

Questions and Exercises on Chapter XX

1. What is the difference between a partnership and a joint stock company ?

2. What is the disadvantage of both ?

3. What is "limited liability" ?

4. What do you understand by the terms "Trade Union," a "Friendly Society," "Strike," "Lock-out" ?

5. Under what disadvantages did Trade Unions suffer in the eighteenth century ?

6. What change in Trade Union Policy occurred after 1850 ?

7. Write a short essay on the evils of Strikes.

CHAPTER XXI

INDUSTRY AND THE STATE, 1820-1880

A GLANCE backward over the last four chapters will reveal the fact that the most striking feature of the second period of the Industrial Revolution was the improvement of transport and communication. Changes in industrial processes *did* occur, and the amount which a man could produce *did* increase ; but these were small and insignificant beside the greater ease and rapidity with which men could travel about, with which goods could be conveyed, from farm or factory to market or shop, and with which messages and instructions could be sent. Without the Railway, the Steamship, and the Telegraph, the factory engine and the mine pump could have done little more than they had done in 1840.

Under these quickening influences factories grew larger and more numerous. Machinery was applied to many processes formerly carried out by hand. Coal and iron were demanded in ever-increasing quantities. And the evils which had been found to exist in the industries first affected by machinery were present, to a greater or lesser degree, in the new.

Extension of Factory Laws. In the earlier period Parliament had found it necessary to make laws regulating the age and the hours of labour of children in the Textile Factories only. Many more Factory Acts were passed between 1832 and 1880. Thus in 1833 women as well as children were forbidden to work for more than twelve hours a day or at night, machinery had to be fenced, and inspectors were appointed to see that the law was obeyed. The half-time system, by which children could not go full time to the factory until they were more than thirteen, was established in 1841, and has only just been abolished by the Education Act of 1918. By successive stages the hours and other conditions of labour in most industries were brought under the control of Parliament, so that the conditions became less arduous and safer in spite of the increase in the amount and complexity of the machinery employed.

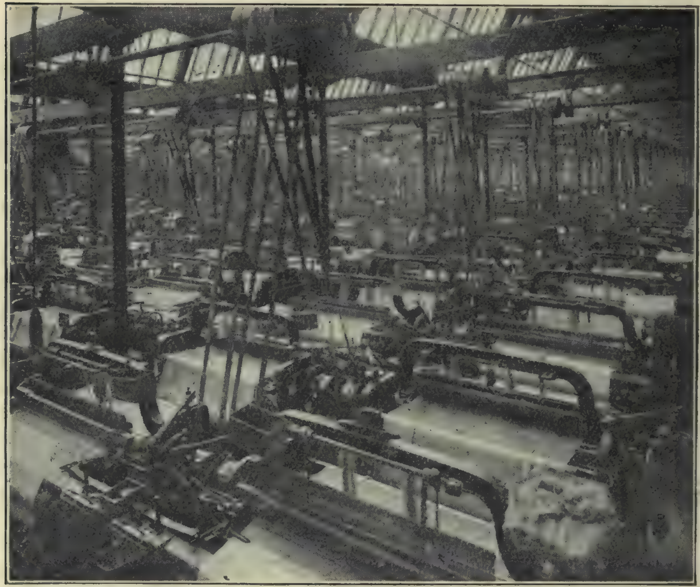

FIG. 49.—INTERIOR OF A COTTON-WEAVING SHED, PRESTON, AT THE PRESENT DAY.

Conditions in the Coal Mines. Side by side with the Factory Acts was also passed a series of Acts regulating the Coal and other Mines in the country. During the earlier period the coal-pits were, for the most part, in out-of-the-way districts seldom visited by people who were interested in human welfare. Manufacturers were using thousands of tons of coal per annum, and townsmen were enjoying the bright coal fire in their homes without giving a thought to the peril or hardships of those who won it from its hiding-place in the earth. But now and again facts leaked out, and in 1840 a Royal Commission was appointed to enquire into the matter. It was found that children in the colliery districts began work in the mines at five, six or seven years of age, and worked for twelve or fourteen hours a day. Their task was to draw the loaded trucks from the coal face along roadways which were often not more than two feet in height. Clad only in a pair of knickers, with a leather belt to which the chain for hauling the wagons was attached round the waist, they lived dreary, laborious lives amidst the grime and filth of their underground prisons.

Mining Legislation. But the conditions under which children worked was only a part of the evil, and when the Royal Commission reported in 1842, Parliament passed an Act which removed the more serious of them. Women and girls were forbidden to be employed underground, and boys also unless they were over nine years of age. Eight years later another Act contained regulations for greater safety and provided for the appointment of inspectors to see that they were observed.

During the next twenty years further steps were taken for guarding against accidents, and the age at which boys could be employed underground was raised to ten.

Even then they had to attend school for twenty-two hours a week until they reached the age of twelve.

The Idea of Control not New. By these various Acts the Government gradually increased its control over the way in which the new and rapidly expanding industries were carried on. Control by an outside authority was no new thing, and it is interesting to note how it had been effected at different periods. It was first exercised by the gilds until the growth of industry in country districts rendered supervision impossible. Then, under the Statute of Apprentices, the Magistrates were charged with the duty of fixing the hours and other conditions of labour. When industry again became carried on in large groups under the Industrial Revolution, the State made laws and ultimately appointed Inspectors of Factories and Mines to see that they were carried out.

There is one difference, however, between the nature of the control in the sixteenth and nineteenth centuries. In the former wages were included in the conditions, and in the latter they were excluded. The State left master and man to fight this out for themselves ; but the struggle which rose out of this fact deserves a separate chapter.

Questions and Exercises on Chapter XXI

1. Set down in tabular form the chief provisions of the Factory Acts of 1833 and 1841.

2. Why was the Coal Mines Act of of 1842 necessary ?

3. Set down briefly the change effected by the Coal Mines Acts of 1842 and 1850.

CHAPTER XXII

NINETEENTH CENTURY POLITICS

Effect of Improvement of Manufacturing Processes. The principal change produced by the mechanical inventions of the eighteenth century was an *economic* one. It was an alteration of the way in which people got a living. Instead of a large number of men working independently or in small groups, there were, at the end of the period, fewer working independently, and many, both men and women, working in large groups. Instead of each man owning the tools and buying for himself the raw material he required, these were provided for him. How it affected him personally, how it led to the growth of the towns, how it led to factory legislation, combination laws, and the Reform Act of 1832, has been told in Chapters XIII. and XIV.

Effect of Improvements in Transport and Communication. Throughout the second period—from 1820 to 1880 or so—these changes continued to spread. The economic revolution was not complete in the first period, and it is not complete to-day. But the railway, the steamship, and the telegraph introduced a new kind of change—a change that was *political* rather than *economic*. For while the mechanical inventions altered the relations of a man to his employer or of a producer to his customer, the new means of transport and communication altered the relation of a man to the government of the country in which he lived.

Lack of News in previous Periods. There were newspapers in the eighteenth century, but the seat of government was London, and it took days for news to creep out to the north and west. Men did not know what was happening until after it happened; they did not know what was proposed until it had become an accomplished fact. What interest could they have in matters of which they were ignorant? Or in plans over which they could have no control?

Lack of Education. Moreover, people were mostly uneducated. There was no State system of schools, and, as we have seen, many children went to work at five, six, or seven years of age. Books were few and expensive, newspapers were dear and slow in coming. The conduct of affairs was in the hands of a few who had education and leisure—the landowner, the lawyer, the manufacturer. The mechanical inventions, and especially the steam engine, had led to the growth of towns and the Reform Act of 1832, and this Act had put political power into the hands of the town manufacturer but not the town workman.

Work of First Reform Parliament. The Reform Parliament immediately set up a new Poor Law, and passed the Municipal Corporations Act, which conferred extended powers of self-government on the towns. They followed this with the Public Health Act of 1848, which enabled town councils to improve the health of the town population. And the towns promoted Bills of their own—called private Bills to distinguish them from those introduced by the Government—which enabled them to supply water and gas to their inhabitants.

The Movements continue. But the steam engine was printing the cheap book and the cheap newspaper, and the locomotive was conveying them rapidly and at small cost to every part of the country. Both the opportunities and the need for education were increasing. Private schools conducted by individuals, and schools carried on by religious bodies were quite unable to provide what was necessary, and the State had to be called in to assist.

The Second Reform Parliament. Before, however, anything could be done Parliament had to be reformed again, so that not merely the manufacturers but the men of the town could vote. As in 1832, the representation of many towns was changed owing to increase or decrease of population. Thirty-five secured the right of separate members, and eleven had the number of their members reduced. But the most important feature of the Reform Act of 1868 was that the *franchise*, or right to vote, was given to all house-holders and to lodgers whose rooms were of the value of £10 a year.

Compulsory Elementary Education. The most important work of the new Parliament was to provide a *National System of Education.* In 1870 an Act was passed which set up School Boards in every part of the country where the accommodation was insufficient, and empowered them to levy a rate for the erection of buildings ; and in 1876 another Act made education compulsory. The final achievement of the railway and the telegraph was the provision of education for all, so that no child, however poor his parents, should be debarred from the rich stores of learning which have been accumulating since the world began, or prevented from exercising the full rights of citizenship which were his due.

QUESTIONS AND EXERCISES ON CHAPTER XXII.

1. What were the three most important Acts of the Reform Parliament of 1832 ?

2. What changes since 1832 rendered the Reform Act of 1868 necessary ?

3. Contrast the first and second periods of the Industrial Revolution.

4. Copy the chart called "Landmarks of the Industrial Revolution" on pp. 112-3, and add columns showing :

(*a*) the accession of the sovereigns,

(*b*) the political changes in the Government, *i.e.* Whig or Tory,

(*c*) the Colonies or Dependencies added to the Empire during this period.

PART V

THE INDUSTRIAL REVOLUTION

3. THE AGE OF APPLIED SCIENCE

1880- ——.

LANDMARKS OF THE INDUSTRIAL REVOLUTION, 1880-1914.

	Manufactures.	Facilities	Political Events.
1880			
	First practical Electric Lamps 1881.		
	Steam Turbine, 1884.	Invention of incandescent gas mantle 1884.	
	First Oil Engine. 1889.		Government Depts. adopted standard rates and wages. 1888.
1890			
		Linotype Machine. 1891.	
		Motor cars. 1893.	
		Wireless Telegraphy. Repeal of Red Flag Act. 1896.	Conciliation Act of 1896.
1900	Diesel Oil Engine. 1900.		
			Workmen's Compensation Act. 1906.
		Invention of wire filament electric lamp. 1905.	Old Age Pensions Act. 1908.
			Miners' Eight Hours Act. 1909.
1910			Trade Boards established. 1910.
			Industrial Commission. National Insurance Act. 1911.
			Coal Mines Act—minimum wage. 1913.

CHAPTER XXIII

POWER

WITH the exception of the water-wheel and the windmill, Watt's steam engine remained for a hundred years the sole source of mechanical power. The first steam engine was sold in 1776, and the Otto gas engine was invented in 1876. The factories which had been constructed, the steamships which had been built, all depended upon the energy of steam. As an invention which influenced human life and thought it ranks equally with gunpowder and the mariner's compass.

Improvements in the Steam Engine. Though men of genius had worked at its improvement all through the century the only result—but that an important one—had been to render it more efficient. It did more and more work for the same amount of coal. At the end of the eighteenth century it required ten pounds or more coal per horse-power per hour. Compared with this the compound engine, in which the steam passed successively through two cylinders, which was introduced about 1856, required only two and a half pounds; while the triple-expansion engine of 1870, in which the steam passed successively through three cylinders, required only one and three-quarter pounds.

There was one defect, however, which could only be removed by a complete alteration in design. It was a "reciprocating" engine. The piston moved backwards and forwards in the cylinder. Twice for each revolution of the crank it had to start from rest, get up a high speed and come to rest again. The mere fact of varying the speed of a moving body results in waste of energy, and what was wanted was a true "rotary" engine in which the steam was applied directly to turn the shaft.

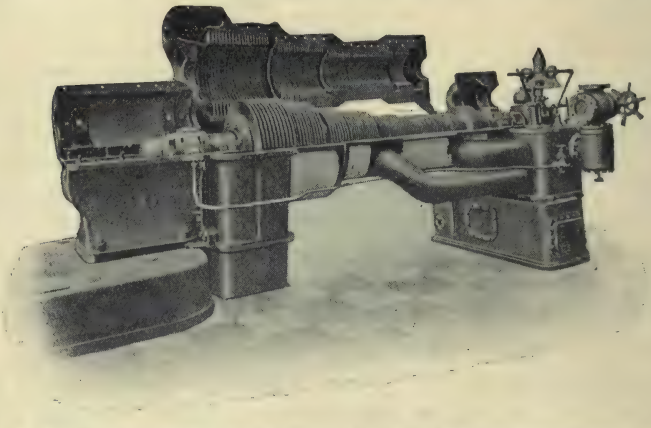

FIG. 50.—1000 KILOWATT STEAM TURBINE ON THE PARSONS SYSTEM, WITH TOP COVER OPENED BACK.

This was how a water-wheel worked: why, therefore, should not a steam engine work in the same way?

The Steam Turbine. The problem was finally solved about 1884 by *Sir Charles A. Parsons* and *Dr. Gustaf de Laval*, who invented steam turbines on two different principles. These principles had been known for hundreds of years, but for want of scientific knowledge and mechanical skill they were applied only in toys. With this machine and improved boilers and "accessories" it is possible to obtain a horse-power per hour for every pound of coal burnt in the furnace.

Internal Combustion Engines. But all steam engines suffer from the disadvantage that the heat is produced in the boiler and has to be conveyed in pipes to the engines, though in some types the journey is very short. They are *heat* engines, and the energy is not in the steam but in the heat which the steam contains. If this heat could be produced inside the cylinder, where it was required, loss would be avoided Papin, in the seventeenth century, had tried to do this by exploding gunpowder, but with no really satisfactory result. The production of gas from coal for the lighting of towns, which had been invented by Murdoch, one of Watt's foremen, in 1792, provided another suitable substance, because when mixed with air coal gas is explosive.

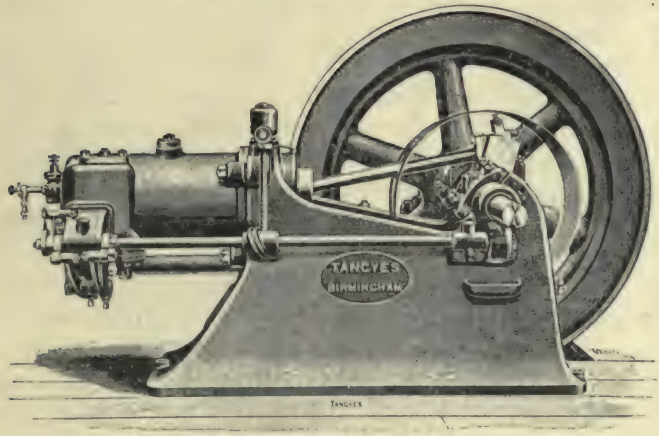

FIG. 51.—GAS ENGINE.

The first to succeed in making an "internal combustion" engine was a Frenchman named *Lenoir*, in 1860, but though a good many were made it was so unsatisfactory that the manufacture ceased when the *Otto* engine was invented in 1876. This engine began to spread immediately wherever there was a public gas supply, though at a later stage special "gas producers" were invented, and as these enable gas to be made from almost anything that will burn, they have been largely used for providing power all over the world in factories remote from coal fields and civilisation.

The gas engine was at first made only in small sizes, and even to-day the largest gas engines are far smaller than the largest steam engines. But it is simple, and requires little room or attention, so that it has enabled power to be used in thousands of small workshops and factories where a steam engine would never have been installed.

But inventors were not satisfied. Eight years after Dr. Otto's patent, *Daimler* constructed an engine to work with petrol, the liquid which is obtained first when petroleum is distilled. This enters the cylinder in the form of fine spray which forms an explosive mixture with air, and excepting the apparatus for producing this spray, called a carburettor, the petrol motor is exactly like a gas engine.

Again, hardly had the petrol motor got beyond the stage of experiment when *Priestman* built an engine to work with paraffin or ordinary illuminating oil such as is used in lamps. This had to pass through a hot chamber in which it was converted into vapour before it entered the cylinder, but as a fuel it is cheaper than petrol. Finally, in 1900 *Diesel* invented an engine which will use the heaviest and cheapest oil.

A proof that the demand for power has not been satisfied is to be found in the fact that these various forms did not replace one another. Each is peculiarly suitable for some particular purpose or to some special conditions, and power has been applied to thousands of uses to which it would not have been applied if only one form of "prime mover" had been available. Each new source of supply has created a new demand, and has encroached very little on the field of those which came before.

Applications of Electricity. The use of power has been enormously extended by the development of electricity. For while electricity is not a primary source, because a steam, gas, oil, or petrol engine is required to produce it, there is hardly any limit to the distance over which it may be transmitted. Moreover, the silence and cleanliness of an electro-motor and the ease with which it can be started or stopped render it preferable in many cases to the noisier engine. It is always ready, and by a single movement of his hand a man can bring energy, produced a hundred miles or more away, to his aid.

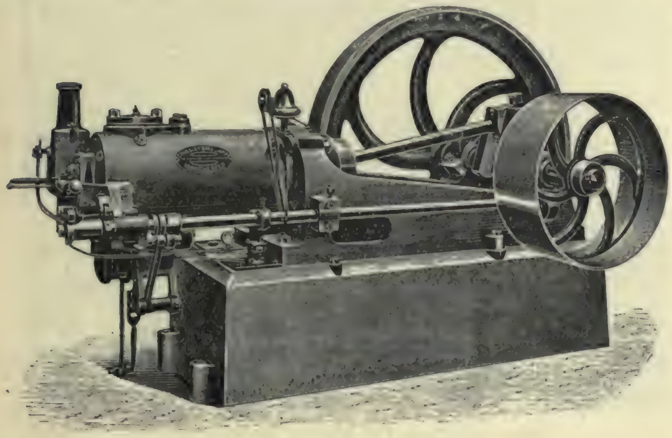

FIG. 52.—OIL ENGINE.

Early attempts. All the wonderful applications of electricity which we see round us to-day are mainly the results of the patience and toil of scientific discoverers during the last hundred years. Volta towards the close of the eighteenth, and Oersted, Ampère, and Faraday in the early years of the nineteenth century laid the foundations upon which others have built. When Faraday had completed his experiments of 1830-2 practically everything was known which was necessary to build a dynamo or electric generator which would produce electricity in large quantities. But the scientific men of the day were poor mechanics, and the mechanics knew too little science, so that it was nearly fifty years before satisfactory machines were made.

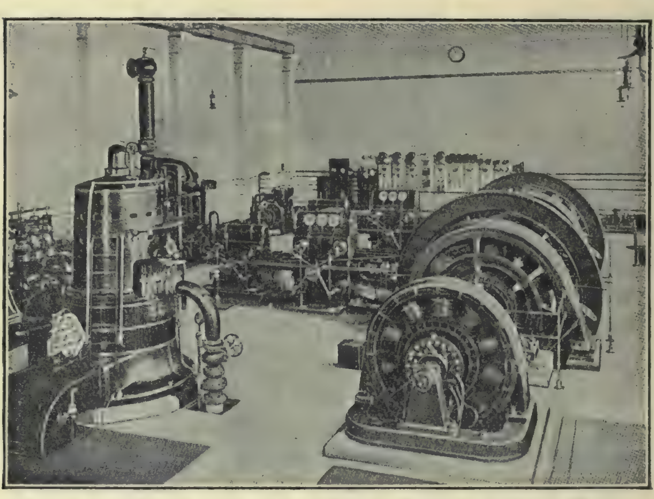

FIG. 53.—POWER STATION AT THE BRITISH THOMSON-HOUSTON WORKS.
Showing a Curtis turbo-generator at the left of the illustration.

Developments rapid from 1880. This occurred just about 1880, within a year of the invention of the first practical electric arc-lamp, and the first effective electric incandescent lamp. The new form of power had already been applied to other purposes, such as electro-plating, or covering a common and easily tarnished metal with one which kept a better appearance; and from 1880 its uses grew so rapidly that those who were not electrical engineers found difficulty in keeping pace with them. In fact, if progress in other directions had been less rapid, the last forty years would still have been famous in the world's history as the Age of Electricity. This rapidly extending use of power has led to a speeding-up of industrial processes. More operations are carried out by machinery, and the machine works more quickly and with greater regularity than the man. If the standard of comfort remained the same—if men were content to live the same narrow lives that their grandfathers lived, surplus wealth would grow enormously, because the amount produced per man grows. But a part of this surplus is rightly lost by men working shorter hours, wearing better clothes, living in more comfortable houses, eating food which is more varied and more nourishing. The skill of the workman and the strength of his muscles have passed into the machine. His life in the workshop is duller and more monotonous: his life outside it is richer and fuller than before.

QUESTIONS AND EXERCISES ON CHAPTER XXIII.

1. Set down in tabular form the dates at which the principal "prime movers" were invented.

2. Describe with sketches how a gas, or oil, or petrol engine works.

3. What are the advantages of electricity as a form of power?

4. What is the effect of an increase in the use of mechanical power on the life and work of the people?

CHAPTER XXIV

MANUFACTURES

Expansion of Manufactures. No one needs to be told that manufacturing operations have increased enormously both in number and variety since 1880. More and more processes formerly carried out by hand are now done by machines, the need for which has kept engineers busy, except for occasional periods of depression, during the last forty years. Within the same period the whole of the vast industry concerned with the manufacture of electrical machinery and apparatus has grown from very small beginnings. The textile industry has been active not only in supplying clothes for the increasing population at home and in other civilised countries, but also in providing for that rising proportion of backward races who desire to dress more or less after the fashion of the white man. The fabrics issuing from the looms of Lancashire and Yorkshire have made great demands upon the works which supply soap and soda, and the dyes extracted from black coal tar. Year after year chemical works have sprung up and have been engaged in wresting from mineral or plant something which the men of our day need to nourish their bodies, add to their comfort, or brighten their lives.

New Methods. There are, however, several features in which manufacturing industry during this last differs from that of the previous periods. And they mark off a stage in progress.

Automatic Machinery. The first is the use of automatic or self-acting machines. These not only save labour, but they work more regularly, more quickly, and with greater trustworthiness than a man. They only became possible when goods became standardised—that is, when a manufacturer could obtain orders for a large number of the same or similar articles. Naturally they were first used for such things as nuts, bolts, and washers, which were required by the hundred thousand. Ultimately they were extended to the manufacture of small parts of machines, such as bicycles, sewing machines, typewriters, and cheap motor cars, which are made in considerable numbers.

Standardisation. It does not usually pay to adopt automatic machines unless they can be kept continually at work. Moreover, the articles must be turned out so uniform in size and shape that they are interchangeable. Many machines are not now made from a specially prepared set of parts, but from parts picked at random out of many dozens or hundreds or thousands in the stores. Whether a thing is made by hand or machine it is cheaper when made in large numbers than when made one or two at a time. The thing is, therefore, cheaper and the repairs cost less. People who could not afford to have these things fifty years ago can afford to have them to-day.

Effect on the Work-people. Not only, however, is the work of the machine narrowed, but that of the man also. An operative who performs one set of movements year in and year out acquires a quickness, accuracy, and dexterity which would be impossible if his work were more varied. By and by the movements he performs become habits, and he carries them out without thinking about them. He becomes a machine. From morning to night his mind is not exercised and he is liable to become dull. It is this danger that has led many people during the last twenty years to demand that the hours of labour should be shortened so that men may have leisure in which to exercise their minds in connection with interests apart from their daily work.

Labour-saving Devices. Together with automatic machinery should be mentioned all those devices such as cranes, conveyors, lifts, by which heavy labour is saved. There are many works in which the material is hardly touched by the hand from the time it is delivered raw at the railway sidings to the time it returns there as finished product. It is whizzed here and there, along travelling belts, up elevators, down shoots, from one stage of the process to another in far larger quantities and with far greater speed than would be possible if it were man-handled. This secures cheapness because fewer men at lower wages are required—generally speaking very heavy manual labour commands high wages because only a limited number of men can do it. The machine requires attention but not physical strength.

Processes under Scientific Control. But the most important distinction between the industry of the nineteenth and the industry of the twentieth century is that the latter has become scientific. The older method was one of trial and error, with failure more frequent than success. The newer method is one of scientific experiment and calculation beforehand which points the way. The older men worked in the dark, and often could not explain why this or that was done. The newer men know beforehand what will happen. Skill and experience have not been replaced but reinforced by scientific knowledge and scientific habits of mind.

Where even thirty years ago a steel works had not a single trained chemist on the staff, it now has a dozen. Where thirty years ago an engineering works had not a single employee who could solve a really difficult problem in mathematics it now has half a dozen. Before 1890 the temperature of a furnace was hardly ever taken, for the measurement of high temperatures had not yet been fully worked out in scientific laboratories. To-day in one works from 3,000 to 5,000 of these measurements may be made in a week.

Scientific Training. In this, the modern period of the industrial revolution, the world in general is reaping the benefit of those wonderful scientific discoveries of the last hundred years. And Great Britain in particular is enjoying the fruits of those educational developments which marked the second period. Scientific education began when Mechanics' Institutes were established in the first half of last century. It was continued and extended by the Science and Art Classes established under the Department of Science and Art in the fifties. But its greatest expansion has been through the Technical Schools and University Colleges erected since 1880. Many men trained in these institutions became teachers and helped to swell the amount of scientific instruction in the country; but many more passed into works and factories, and if British industries are to maintain their reputation, many more are required.

Questions and Exercises on Chapter XXIV.

1. The more goods are made the more seem to be required. Can you explain this ?

2. What do you understand by "Standardisation" ? What are
(*a*) The advantages,
(*b*) The disadvantages ?

3. From the figures in Mulhall's "Dictionary of Statistics" draw graphs showing the increase in the production of

- (*a*) coal,
- (*b*) pig-iron,
- (*c*) steel,

in Great Britain.

CHAPTER XXV

TRANSPORT AND COMMUNICATION

THE main features of railway development since 1880 have been (*a*) the provision of fast non-stop trains between important towns, (*b*) the arrangements of rapid frequent services between the centre of a large town and its suburbs.

FIG. 54.—TRAIN ON THE LONDON AND NORTH-WESTERN RAILWAY.

Express Trains. Through express trains are essential to the speeding-up of commerce and industry. A man's business in not now confined to his immediate neighbourhood, and wherever the works of a large manufacturer are situated he must have a London office. Neither merchants, nor manufacturers, nor professional men, nor the vast army of commercial travellers care to waste time on long, slow journeys, and they are sufficiently numerous to justify railway companies in providing trains specially for them.

Suburban Service. Again, with the growth of the town in size and the increase in prosperity more and more people prefer to live on the outskirts where the outlook is more cheerful and the air more pure. They are often willing to give an hour to the return journey, morning and evening, so all large towns have a residential fringe which is longest along the railway lines that radiate from the centre. And as the town is well provided with large, well-stocked shops, the suburban lines bring a wider range of customers within their reach.

Electric Railways. Suburban traffic has been rendered easier by the introduction of electric traction, which has many advantages. A steam train is hauled along by the friction of the wheels of the locomotive only, while an electric train can be made up of any size and may have several coaches provided with motors. The grip on the rails is therefore distributed over the trains which gets up speed more quickly after a stop.

Again, tunnels and underground railways are difficult to ventilate properly when steam is used. The railway under the Mersey between Liverpool and Birkenhead never paid until it was electrified in 1892. Again, the atmosphere of the old Metropolitan Railway was at times almost unbreatheable owing to the smoke from the locomotives; and the deep tube railways of London, 90 feet to 250 feet below the surface, would have been impossible if electric motors had not been invented. The first electric railway was exhibited at the Berlin

Exhibition of 1881, and to-day there are many thousands of miles of electrified line in the world. But it is only within the last twenty years that progress has been rapid.

The date of electrification of the Mersey Railway has already been mentioned. The Liverpool Overhead Railway, which runs on an elevated platform for ten miles along the docks, was opened in 1892; the first tube railway, the City and South London, in 1893. Later came the Liverpool-Southport, and the Lancaster, Morecambe and Heysham line, and since then there has been a large development in and around London, from Manchester to Bury, and on the North-East Coast.

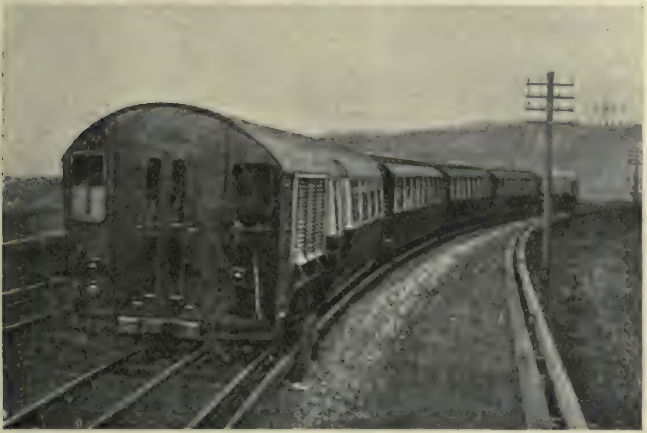

FIG. 55.—ELECTRIC TRAIN.

Electric Trams. The concentration of people in towns has again been rendered possible by electric trams which, though introduced in the eighties, did not make much progress until after 1898. In the middle of the century the provision of such necessities as gas or water had been in the hands of public companies. These companies held "monopolies"—that is, they were the only people from whom gas or water could be obtained. According to the political ideas of the time, monopolies were bad. The proper proceeding was for the town to own its gas works and water supply. But since the town was not always willing to undertake this duty for itself and a company was prepared to do it, the company was allowed with certain safeguards.

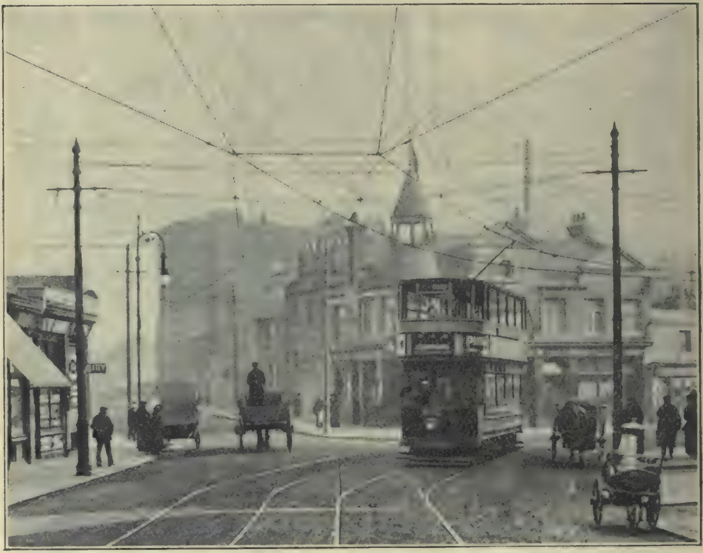

Photo. Topical Press Agency.

FIG. 56.—A TRAMWAY JUNCTION.

Now before electric traction was introduced, horse-drawn trams were used, and these were often established by companies. The *Tramways Act* of 1870, under which these arrangements were made, did not encourage enterprise on the part of the companies. For one thing, the town council could buy them out after twenty-one years at what was called a "scrap-iron price." There was not much encouragement to keep the line or the trams in a good state of repair, and none at all to spend money in electrification. The consequence was that not many tram-lines were electrified until after 1898, when in most cases the twenty-one years had come to an end.

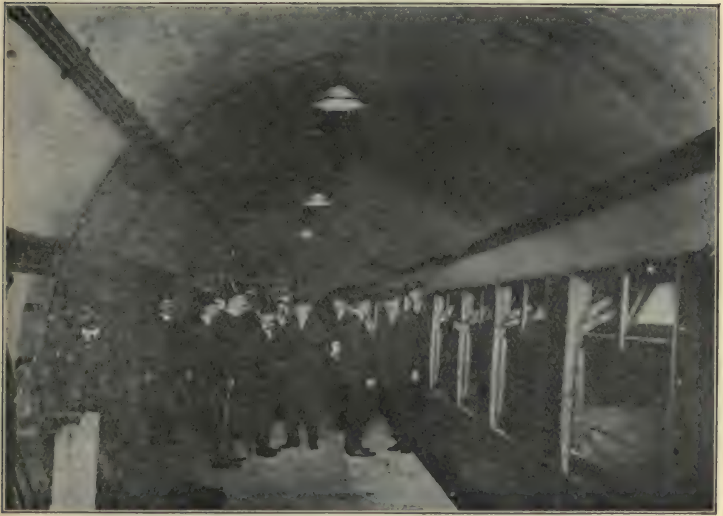

FIG. 57.—BOARD OF TRADE INSPECTION AT PADDINGTON. BAKERLOO EXTENSION OPENED DEC. 1, 1913.

Electric trams have added very considerably to the area from which a workshop, factory, or mine can draw its labour; and conversely, to the area over which a man can seek work without changing his place of residence. They have enabled many work-people to live at a distance from their work, and thus to escape from the closely crowded dwellings of the town.

Motor Cars. The rapid conveyance of goods on ordinary roads has been aided by the motor wagon driven by an internal-combustion engine working on petrol or paraffin, and by the steam wagon. Though the petrol engine was invented in 1884, and the oil (or paraffin) engine in 1888, it was some years before these could be employed for the propulsion of vehicles on ordinary roads. The slow and lumbering traction engine which preceded them had been controlled by the *Red flag Act*, which limited the speed to five miles an hour and required a man carrying a red flag to walk twenty-five yards in front of the dangerous monster. Until this Act was repealed in 1896 no progress was possible in this country, though the new mode of transport made great strides in France and the United States where there were no restrictions.

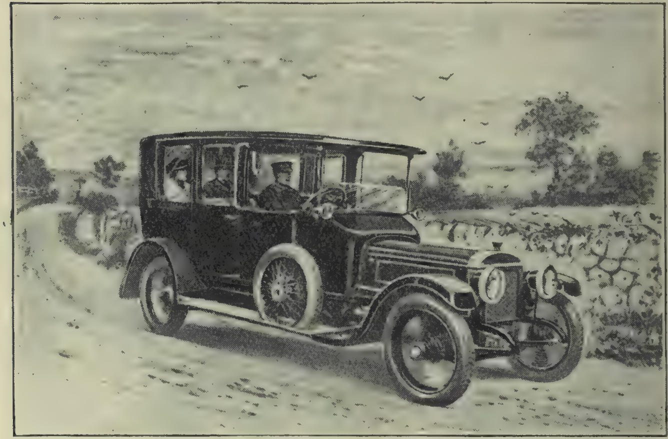

FIG. 58.—MOTOR CAR.

Invention of the Electric Telephone. The electric telegraph was re-inforced after 1877 by the telephone, invented by *T. A. Edison* and *Graham Bell.* It is much quicker, when the line is clear, because you can speak

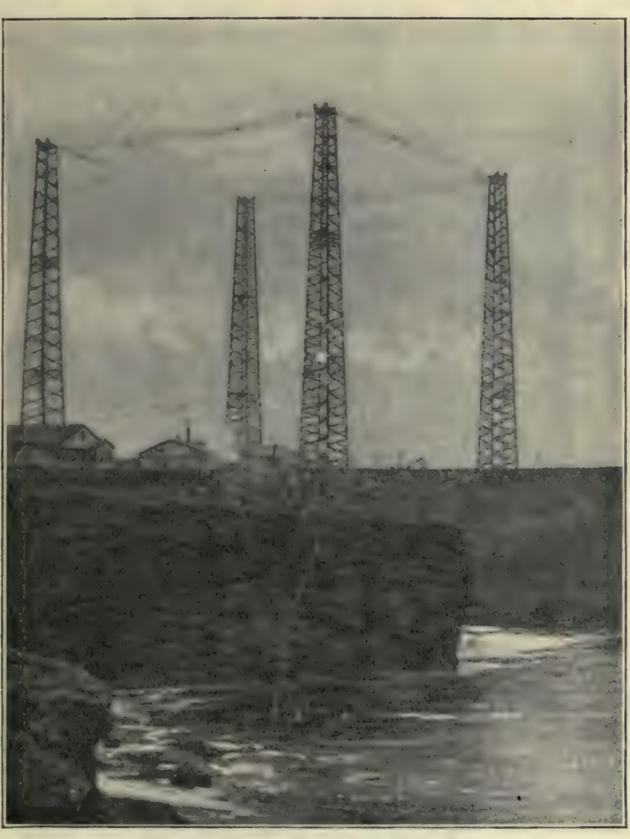

FIG. 59.—WIRELESS STATION, CAPE RAY.

directly to the person with whom you wish to communicate, and more can be got into two or three minutes' conversation than into many telegraph messages. An answer can be obtained and another question asked and answered before a telegraph message can be written out. The actual saving of time is far greater than that achieved by the telegraph, but, until the invention of wireless telegraphy in 1896, the range was smaller.

Wireless Telegraphy. No achievement of modern times illustrates so clearly and forcibly as wireless telegraphy the way in which the pursuit of truth for truth's sake leads in many cases to results which confer immense benefits upon mankind. In 1875 *Clerk Maxwell* prophesied that electricity exerted its influence across space in a form of waves or ripples like those which are formed on the surface of a pond into which a stone has been thrown. Years later *Hertz* actually detected these waves, measured their length and discovered other facts about them; and in 1894 *Sir Oliver Lodge* used these waves to transmit signals up to a distance of about sixty yards. Then *Branly* invented a new detector

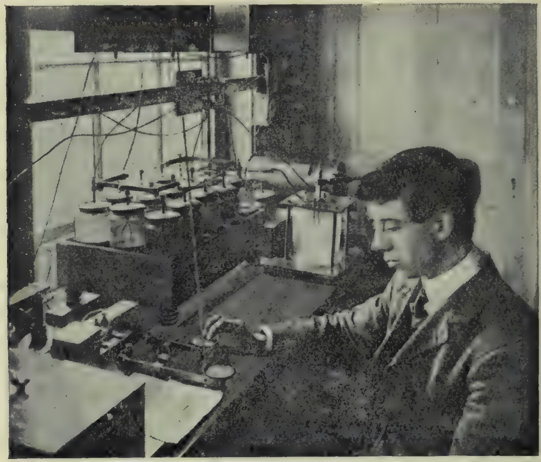

FIG. 60.—WIRELESS OPERATOR (MARCONI SYSTEM).

called a "coherer," and from this *Marconi* got the idea that messages might be sent by their aid. His system of wireless telegraphy was invented in 1896, and in 1901, using a magnetic detector superior to the coherer, he flung his message across the broad Atlantic. To-day a message can be flashed with the rapidity of lightning across ten thousand miles of space.

Improved means of transport and communication have speeded up the operations of commerce and quickened the processes of industry. They have altered the conditions of life and labour. They have brought men closer together, increasing perhaps the possibility of quarrels, but also multiplying the opportunities of friendship. They have not rendered war impossible, but more terrible and less likely to occur. And they form the links in a chain which binds mankind into a universal brotherhood, to be broken less easily by those evil influences which seem to lose none of their strength with the passing years.

QUESTIONS AND EXERCISES ON CHAPTER XXV

1. What are the advantages of rapid and cheap transport ?
   (*a*) To the manufacturer,
   (*b*) To the shopkeeper,
   (*c*) To the working man and woman ?

2. In what ways has electricity been of advantage in transport ?

3. The more means of transport are extended, the greater seems to be the need. Can you explain this ?

4. Compare the advantages of the telegraph and telephone.

5. Write a short essay on Wireless Telegraphy.

6. From the figures in Mulhall's "Dictionary of Statistics" draw a graph showing the increase in railway mileage.

7. From the figures in Mulhall's "Dictionary of Statistics" draw a graph showing the increase in the tonnage of British shipping.

CHAPTER XXVI

INDUSTRIAL COMBINATION

Increase of Companies in size. The conduct of industry on a larger and larger scale has rendered it necessary for capital to be employed in larger amounts. It was partly for this reason that the partnership of the eighteenth century gave way to the limited liability company of the nineteenth. A large business under a partnership could only be carried on by a few very rich men, while the formation of limited liability companies enabled a very large number of people to invest their savings. Companies with £10,000 capital gave way to larger ones with £100,000, and to-day there are firms which employ many millions.

Manner of Growth. This expansion has usually taken place by large and successful companies buying up smaller, and not infrequently it is the result of a fierce struggle between competing firms. Articles which are made in quantity cost less each to make the larger the quantity made, so that each firm tries to increase its sales. Prices are "cut" or reduced from time to time until one firm becomes bankrupt, closes down, or is bought up by the other. In this struggle costs are kept as low as possible, and as wages are part of the costs of production the conflict is used as a reason for not increasing them. But poorly-paid labour is not often efficient, and a wise expenditure on scientific advice and assistance often leads to greater economy of production. Successful firms may owe something to the ruthlessness with which they have treated their competitors and their work-people, but as a rule the more enterprising and enlightened firms survive.

Trusts and Cartels. The modern period has witnessed new kinds of combinations of capital in the *Trust* and the *Cartel.* The trust is a combination of competing firms under a single management. Having thus destroyed competition and secured a monopoly they can charge the public what they like for the goods they produce. But a great saving is possible by production on a large scale. Raw material can be purchased in larger quantities and at a cheaper rate, and sometimes the trust owns its own sources (*e.g.* mines and quarries) from which the raw material is obtained. Again, the duplication of advertisement expenses is avoided, and orders are distributed to the different factories so that there is not overtime in one and machinery standing idle in another. So it does not follow that a monopoly results in an increased price to the consumer. The profits are certainly greater and the price may be less.

Nevertheless, trusts are unpopular for several reasons. The monopoly they hold enables them to raise the price or at least to keep it up if they wish to do so. They use a public need to make large profits for themselves. They immediately crush out any small firm which endeavours to supply the same kind of goods or services, and this is opposed to ideas of liberty and fair play. In aiming at any opinion on trusts the advantages and disadvantages must be weighed one against the other.

The cartel is an association of firms for the purpose of regulating prices at which goods are sold to the public. Each firm retains its independence of management, whereas in the trust the management is centralised. The cartel is, in fact, a selling rather than a manufacturing combine, and it reached its highest form of development, before the war, in Germany.

It will be seen, therefore, that while the tendency is all towards the big company, trust, combine, or cartel, the feeling against them is one of suspicion if not of actual hostility. Everyone wishes to live on a higher standard of comfort, to enjoy more of the things of beauty, use, or comfort which issue in an ever-widening stream from the factories of the world. Yet if the companies are not allowed to expand, if the trust is not to destroy competition by absorbing competing companies, the things that are desired cannot be more cheaply produced, unless, of course, the process is improved or wages fall. Here is a problem for the men and women of the coming years.

Co-operation. There is another very important form of combination which, though it began in the last period, is more appropriately considered here. That is *Co-operation.* It began in 1844, when twenty-eight men, known since as the *Rochdale pioneers,* subscribed £1 each to start a retail shop in the house of one of their number. They bought larger quantities, chiefly groceries, at a cheaper rate than if each had purchased what he required separately, and sold the goods among themselves at the ordinary market price. New members had to pay the fee of £1, and at the end of the first year's trading they had seventy-four members and a capital of £187—money which they had received and goods left unsold. Each member received five per cent. interest on his £1 share, and the £22 profit remaining after that and the expenses of management had been paid was divided among the members in proportion to their purchases.

Societies formed on this plan soon spread all over the industrial districts of the North, and were highly successful. In addition to groceries they began to deal in drapery, meat, and bread, gradually widening their range until it covered the whole field of food and clothing. There are now more than 1,500 societies with a membership of one-fifth of the population of the country, and the profits are more than £10,000,000 a year.

It will be noticed that the difference between a co-operative society and an ordinary retail trader or trading company is this:—that in the latter case the profits go into the pockets of the trader or the comparatively small number of shareholders who provide the capital of the company, while in the former the profits go into the pockets of the consumers, because the consumers are all shareholders. The societies have certain advantages, *e.g.*—in freedom from income tax, and the private trader regards them as competing unfairly with him.

In 1864 the retail societies founded the Co-operative Wholesale Society, which is related to them both as manufacturers and merchants They provide the capital and the Co-operative Wholesale Society makes or buys at wholesale prices the goods they require. And as it can buy in very large quantities it can buy at a cheap rate.

Many other attempts in various forms, such as Co-partnership and Profit-saving, have been made to avoid the divisions between Capital and Labour. They seek to give the workman an interest in the business and a share of the profits, but it is not possible to explain them within the limits of this book.

The Trade Union Movement. Turning now to the progress of combination of labour, it will be remembered that Trade Unions secured legal recognition in 1875, just as a wave of depression spread over the country.

For the next fifteen years, therefore, they were not very successful in securing increased wages, or any other demands in which they were interested. Meanwhile they fell to some extent under the influence of a new kind of political teaching. For the preceding twenty-five years there had been little difference between their political views and those of most Liberals.

Trade Union Politics. They now became largely socialists or collectivists, believing that private enterprise and private ownership of land and other means of wealth made slaves of men who had only their labour to sell. They advocated the *nationalisation* of land and all forms of capital, and the abolition of private profit and personal gain.

Aim of Trade Unions. At the same time socialism and trade unionism must not be confused. They are not identical. The former is a political theory held by many who are not trade unionists ; the latter are associations whose main purpose is insurance of their members against poverty and destitution, and whose secondary purpose is to improve their standard of comfort. The friendly society or insurance work goes on all the time, though since it is not noticed in the newspapers people are apt to forget that it exists. Strikes, on the other hand, receive wide publicity, and are erroneously regarded as absorbing the greater part of trade union energy.

Organisation among unskilled Workers. Industries are so interlocked that a strike in any one of them produces much inconvenience both in other trades and to the general public, and those who are responsible for them have always been regarded with disfavour. But towards the end of the nineties there was a good deal of public sympathy with poorly paid labour, and a strike of women and girls in a match factory in 1888 received liberal aid from public subscriptions. The same thing occurred on a much larger scale in 1889 when the great London Dock strike occurred. No less than £48,000 was contributed and the men won. It was the first time that a body of unskilled labourers had been organised, the earlier unions having been established by skilled workers.

Trade Union Rates recognised. Two results followed. In the first place the unions increased rapidly in number and strength, and in the second the rate of wages paid to trade unionists became a standard rate for the district. In 1888 the Government had laid down the rule that all work done for any of its departments should be paid for at *standard rates*; and their example was followed by the London School Board, the London County Council, and ultimately by most Local Authorities. This meant, first, that the wages which trade unionists had been able to secure for themselves were regarded as reasonable, and, secondly, that public bodies, at any rate, had no right to take advantage of men being willing to work for less. In other words, the idea had arisen that wages ought not to be the lowest for which a man's services could be obtained, but such as would enable him to live in decency and comfort.

More recent Policy of Trade Unions. Since these benefits were secured Trade Unionists, without becoming less socialistic, have devoted more attention to obtaining better conditions of life through the action of the Government and the municipalities—that is, the town, city, and county councils. They looked especially to the Government of the day to help them in securing a redress of their grievances. It was difficult, however, for Parliament to interfere in disputes until both employers and work-people were so well organised that the leaders on each side could speak for the whole body. No agreement was of any use unless it was binding upon all. A preliminary step had been taken in 1860 by the establishment of a Board of Arbitration and Conciliation for the Hosiery and Glove Trade in Nottingham, and another in 1846, when a similar Board was set up for the Building Trade in Wolverhampton. The most famous example is the Brooklands Agreement of 1892, by which no strike can take place in the Textile Trade until the dispute has been considered by a joint committee of masters and men. Further, Acts to encourage the creation of these Boards were passed in 1867 and 1872, but the state of feeling in the country was not yet ready for them.

The State takes a Hand. Real progress in the settlement of disputes was made in 1896 when an Act was passed giving the Board of Trade power to approach the parties, set up a joint committee, or appoint an Arbitrator who would hear evidence from both sides and give a decision. This plan was so far successful that an Act of 1911 provided for a permanent *Industrial Commission* for the same purpose.

QUESTIONS AND EXERCISES ON CHAPTER XXVI.

1. How do companies grow ?

2. What is a trust and what are its advantages ?

3. Why are trusts unpopular ?

4. What is a "Cartel" ?

5. Do you think that trusts are liable to extend in the future ?
Give reasons.

6. Give a short explanation of retail Co-operative Societies. What advantage do they offer to their customers ?

7. What change in Trade Union opinions took place in the eighties ?

8. What were the results of the strikes among unskilled work-people in 1888 and 1889 ?

9. When did the State begin to exert its influence in the settlement of labour disputes ?
Why could it not do so before ?

CHAPTER XXVII

INDUSTRY AND THE STATE

THE progress of factory legislation between 1830 and 1880 had been mainly in the direction of increasing the number of occupations the conditions of which had been controlled by law. The more serious evils had been swept away, and a system of inspection established which, while quite inadequate even to-day to ensure that the law is always obeyed, certainly enabled the Government to see that its wishes were carried out in the majority of cases.

Main Features of Factory Legislation since 1880. The movement since 1880 has three main features. In the first place the Acts have been based on a more scientific study of the conditions. In the second place they have been concerned very largely with the health and safety of the work-people. And in the third, they have dealt with wages as well as with hours of labour.

The earlier Acts were due to the power and influence of men who, like *Lord Shaftesbury*, were filled with sympathy for the weak and helpless. The latter were the results of careful enquiries, a study of the conditions under which people lived and worked, and an examination of the causes and means of preventing accidents. The House of Lords appointed a Committee in 1889 to enquire into the "Sweating" System—the system under which in certain trades the people had to work terribly long hours in order to get a living at all. And between 1886 and 1893 Mr. Charles Booth carried out an exhaustive enquiry into the "Life and Labour of the People in London."

Regulations for Dangerous Trades—Employers' Liability. Again the Home Secretary has been empowered to make or to approve special regulations for dangerous trades with a view to the prevention of accidents, and laws have been made by which a workman is compensated by a money payment, provided the accident was not due to his own negligence. This compensation had always been possible to some extent under *Common Law*, which means a custom or customs which were so generally followed that they were recognised and had been "codified" as the law of the land. Under an Act passed in 1847 the nearest relation of a workman killed in an accident could obtain compensation if the workman, had he lived, would have been able to do so. But the *Employers' Liability Act* of 1880 provided for the payment of a sum of money, not greater than three years' earnings, and it was extended by the *Workmen's Compensation Act* of 1906 to cover a much greater variety of occupations. To protect themselves against losses under these Acts the employers take out an insurance policy—that is, they pay an annual sum to an Insurance Company which undertakes to re-pay to them any compensation which they may have to pay on account of a workman in their employ.

Regulation of Wages. The first Act regulating wages was passed in 1910, and applied to ready-made clothing, lace mending and finishing, box-making, and chain making. These occupations were poorly paid, and in many cases the work was done at home. Trade Boards were set up for the purpose of fixing a *minimum wage*—the lowest wage which any employer was allowed to pay. Similar Acts had previously been passed in Australia and New Zealand. A very important extension of this principle took place in 1913, when a minimum wage was established in Coal Mines. It arose from the fact that while a hewer can earn good wages in some parts of the mine, he had a difficulty in earning a living in others. It was argued, and admitted, that whether coal be easy or hard to get, the man who gets it must live.

Throughout the last hundred years, therefore, and especially during the last eighty, the State has gradually been extending the area of its control, and strengthening its hold upon the operations of the workshop, the factory, and the mine. Not only the employer, but the workman also, must obey the law.

QUESTIONS AND EXERCISES ON CHAPTER XXVII.

1. State the main changes in the reasons for and the object of Factory Legislation since 1880.

2. What do you understand by "Common Law," "Employers' Liability," "Workmen's Compensation"?

3. What steps have the State taken to regulate wages?

CHAPTER XXVIII

INDUSTRY AND THE POOR LAW

EVERY violent change in the methods or management of industry has brought poverty, hardship, and suffering in its train. This was so in the Middle Ages when the Black Death cast its shadow over the land and broke down for all time the customs of the Manor; and its effects were felt until the strong hand of Elizabeth's ministers dealt with the problem through the Poor Law of 1602. Again, in the eighteenth century, the revolution in agriculture and industry caused widespread distress, and led to the unwise action of the Berkshire justices who, in 1795, supplemented wages out of the rates. Then, finally, the Reform Parliament of 1832 passed two years later the Poor Law which continued in force until 1918.

Defects in the Poor Law. Though this law served its purpose for a long time there have been repeated attempts during the last thirty years to find better methods for relieving poverty than that provided by the law. The Poor Law had two disadvantages. One was that it relieved but did not prevent the evil. The other was that those who received relief were called paupers and lost their vote and other rights of citizenship.

A careful study of the industrial system which had sprung up during the last two centuries showed that thousands of people were at the mercy of forces over which they had no control. Their wages were too low for them to save up against hard times, and when trade was poor they were liable to be thrown out of employment. Further, when, by reason of sickness or old age they were unable to work they had to accept relief or go into the workhouse and suffer disabilities against which their pride rebelled.

Old Age Pensions. The Government had to take action, and in the first place they dealt with the most helpless cases. Old people who had not been able to save, or at any rate who had not saved enough to keep them when they ceased to work, were provided with pensions by the Old Age Pensions Act of 1908. The age at which they became eligible was seventy, the amount was five shillings per week, and whoever received it must have less than a certain income of his or her own. During the War the allowance was raised to seven shillings and sixpence and since to ten shillings a week to meet the increased cost of living.

National Insurance. The next step was to establish a scheme of National Health Insurance, and by the Act of 1911, everyone over sixteen years of age with an income less than £160 a year became an insured person. As amended by the Unemployment and National Health Acts of 1920-1, the limiting income was raised to £250, and contributions for skilled workers were fixed at 1s. a week for a man and 10d. a week for a woman, the employer paying 1s. 1d. per man and 1s. per woman in addition. Different rates apply to boys and girls under eighteen and to those receiving less than 16s. weekly. In return for this payment the State provides sick pay, free medical attendance and unemployment pay when absence from work is due to causes other than a strike. The payment varies from 6s. to 15s. a week, and depends upon age, sex, and duration of payment. It is allowed for only a certain number of weeks per year.

The Old Age Pensions Act affects over 1,000,000 and the Insurance Acts of 1920-1 more than 15,000,000 people. Before the Acts were passed poor, thrifty, and hard-working men and women lived in constant fear of the workhouse. Many of them would have starved rather than ask for aid, and they kept their aged fathers and mothers in their own homes, feeding and clothing them on their slender means, rather than allow them to enter the hated institution. Since these Acts were passed, therefore, the Boards of Guardians have had to deal mainly with the thriftless beggar, the tramp who will not work if he can help it, who has no self-respect and deserves no consideration from the nation to which he belongs.

Employment Exchanges. But the object of the Government has been not merely to encourage people to save. If they are to be contented and prosperous they must be in regular employment. It was better to find a man fresh work than to give him unemployment benefit. The difficulty was that though he was anxious to get something to do he did not know where to find it, and it was dreary work tramping the country in search of a fresh job. So in 1909 a system of Labour (now called Employment) Exchanges was set up all over the country. Employers in need of work-people notify the nearest Exchange, and men in need of employment go there to find it. Not only are employers and work-people in any town brought into touch with one another, but those also in different towns; for the Exchanges are all linked up with one another and the general position in each district is made known to all.

Juvenile Employment Exchanges. Again, special arrangements are made for young people under eighteen. In some towns the Juvenile Employment Bureau is attached to the Employment Exchange and in others to the Education Office. Here boys and girls can obtain information and advice as to the various occupations, and can avoid making the mistake which has so frequently occurred, of taking a false step at the outset of their careers.

In this way, then, during the last ten years, an immense system has been built up for helping people to find, not merely work but the right kind of work, for lending them aid when from sickness or other cause they are thrown out of employment, and for removing some of the anxieties of their declining years. If it had come before how much pain and how many tears might have been saved! But the Parliamentary machine moves slowly, and the mind of the Nation behind it is almost as slow. If evils are to be avoided in the future, the people must know more of what is going on and whither it is leading them; they must think more deeply upon the problems of their time; and they must act more quickly than they have done in the bygone years. You may steal a year from the future, but those that are past are lost beyond recall.

QUESTIONS AND EXERCISES ON CHAPTER XXVIII.

1. What is a Poor Law?
2. What were the disadvantages of the Poor Law of 1832?
3. State what provisions are now made to prevent destitution.

CHAPTER XXIX

FREE TRADE AND TARIFF REFORM

During the preceding period the manufacturers had secured the freedom of trade which they desired and had prospered greatly. The farmers also had been able to hold their own by the employment of better methods of cultivation and the stoppage of exports from Russia and America. But the great supremacy in manufacture could not last for ever. After the Civil War in America in 1860-4, the vast resources of that country were utilised so that the people of the United States first became less dependent upon Great Britain for manufactured goods, and then actually entered into competition with her. Again, the end of the Franco-German war in 1871 brought peace to Europe which was to last for many years, and Germany especially began to develop her industries with remarkable energy.

Foreign Competition. The countries which were later in development had all the advantage of the pioneer work which had been done in the British Isles, and in some respects their resources were richer and larger than our own. The discovery of natural gas and of oil in Pennsylvania, of the valuable deposits of copper ore and high-grade, easily-mined iron ore near Lake Superior, provided a powerful stimulus to American industry; while the invention in 1878 by two Englishmen, Thomas and Gilchrist, of the basic process of steel making enabled Germany to utilise immense deposits of phosphatic iron ore in Luxemburg which had formerly been useless. British goods were no longer paramount in the markets of the world, and even the home country was flooded with cheap goods of foreign manufacture. The fate which in the eighties and nineties had fallen on British agriculture now fell also upon British industry.

Causes. There can be no doubt that some of this non-success was deserved. Manufacturers had been content to live on their reputation. They had not progressed. The German and the American had not hesitated to scrap old machinery and put in new, as well as to employ scientific men to control the process and devise new methods. They had, in fact, displayed all those qualities of enterprise for which an earlier generation of British manufacturers had been distinguished. And they were reaping the benefit.

But this was not all. The competition was bound to be keener as other countries developed their resources. Moreover, there was no reason to expect that it would always be fair. Commercial warfare is as ruthless as that conducted by armed forces. Complaint was made that goods were "dumped" in Great Britain by foreign manufacturers at cost price or even lower. The price was certainly lower in some cases than in the country from which they came. It paid the foreigner to do this because he could keep his factory working, produce goods at the lowest cost, and ultimately, perhaps, destroy his competitors and secure a monopoly.

Furthermore, it was complained that while foreign goods entered Great Britain free of duty (except sugar, tea, tobacco, wines and spirits) other countries charged an import duty on British goods, which raised the price to the foreign buyer. It was therefore becoming increasingly difficult to sell British goods either at home or abroad.

Demand for Protection. Hence many manufacturers joined the farmers and landowners in asking for protection. This means that they asked for an import duty, or tariff, on foreign goods. But here arose difficulties. Farmers and landowners wanted a tax on imported corn, while the manufacturers desired no tax on food lest the price should rise and there should be a demand for an increase of wages to meet it. The manufacturers who used foreign raw material wanted that to come in free. This raised the question—what is "raw material"?—To the weaver yarn is raw material, while to the spinner it is a finished product.

Fig. 61.—Customs House, London.

Tariff Reform and Colonial Preference. When the late Mr. Joseph Chamberlain proposed Tariff Reform in 1902, however, his plan differed in one important respect from the older "protection." He asked for a tax on foreign goods with a preference for those from the Colonies. This means that goods from the Colonies were to come into the country free or at a lower rate. He argued that this plan would bind the Colonies more closely to the Mother Country. The question was now not one merely of Finance, but of Empire.

The idea of preference was not new: the practice of making commercial treaties or special commercial agreements between countries was old. But the "imperial" character of the proposals rendered it necessary, or at any rate desirable, to consult the Colonies before action was taken.

While many Free Traders have become supporters of the new policy on the ground that Free Trade is only sound if there is Free Trade all round, it made very little progress among the electors before the War. The struggle has been and will be bitter, because, while some men claim to be suffering disadvantages under Free Trade, others contend that Tariff Reform would not only shift the burden but make it worse for all. There is fear lest food should be taxed, and both sides admit that the price of things would rise. But Tariff Reformers hold the opinion that the home trade would be benefited, employment would be more regular, and people would be, on the whole, better off. Whether, however, a war of tariffs would be less ruinous than Free Trade is said by some to be, is a subject to be discussed fully by older and wiser people and larger books than this.

QUESTIONS AND EXERCISES ON CHAPTER XXIX.

1. Why could not British manufactures retain the supremacy they had gained before 1880?

2. Who have been our principal competitors in recent years?

3. Write notes on "Tariff Reform" and "Colonial Preference."

4. Give any facts you can for or against:
   (*a*) Free Trade.
   (*b*) Tariff Reform.

CHAPTER XXX

BRITISH AGRICULTURE SINCE 1880

WITH the dawn of the third period of the Industrial Revolution, farming entered on a long period of depression. From 1874 to 1882 there was a succession of bad seasons which were unfavourable to crops, while the railway developments in America, on the Continent, and in the Colonies, enabled immense supplies of corn to be imported at a low price. The worst stage was reached in 1894, when wheat fell below twenty-three shillings a quarter.

Agricultural Legislation. The Government endeavoured to relieve farmers by a series of Acts which removed some of the disadvantages under which they worked, or gave them small privileges. The laws under which a man rented land had been passed by Parliaments of landlords and were all in their favour. But under the Acts of 1875, 1883, and 1900, a tenant farmer could claim compensation on quiting his holding for improvements which he had made during his tenancy. Again, in 1906, he was allowed to grow what crops he chose, whereas formerly he had been bound in this respect by a clause in his lease. Further, the Act of 1880 gave the tenant the right to kill the rabbits and hares on his land, so that not only were his crops damaged to a smaller extent, but he could eat or sell what he killed. Finally, the Acts of 1896 and 1901 relieved him of half the rates on land apart from buildings.

Arable Land converted to Grass. The farmer on his part kept down expenses by resisting as far as possible all demands for increase of wages, and by converting arable land to grass, which in the long run was bad for him, and worse for the nation. Grass-land requires less labour, but will not yield the same quantity of beef which can be produced from crops grown upon it. So while the demand for food was increasing with the growing population, the amount of land devoted to corn decreased, and the supply of meat was not increased in the same proportion.

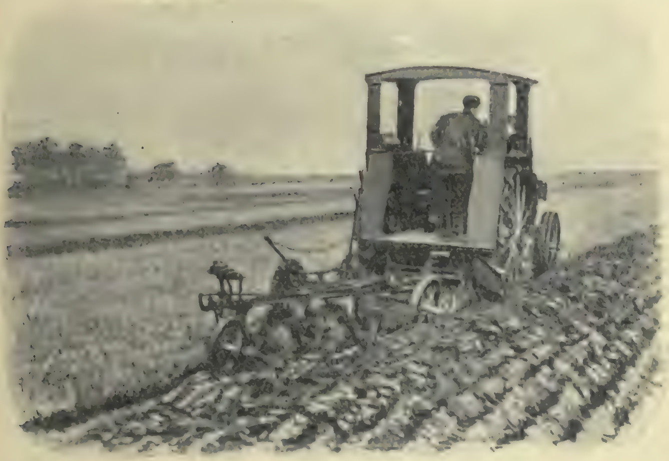

FIG. 62.—A PRESENT DAY METHOD OF PLOUGHING.

The Meat Problem. There would indeed have been a serious shortage of meat if it had not been found possible to import it in larger quantities from America, Argentina, Australia, and New Zealand. Live cattle could be and were imported from the United States, but they suffered a good deal on the journey, and the other countries were too far away to render this method successful. The plan adopted was to provide ships with freezing machinery so that the meat could be frozen and kept in "cold-storage." Under these conditions the process of putrefaction is retarded and meat and other foods can be kept wholesome for an indefinite time.

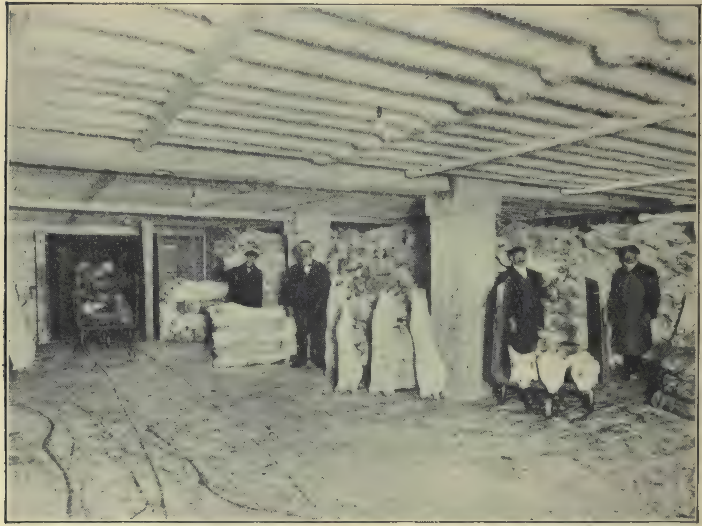

Photo. Sports and General Press Agency.

FIG. 63.—INTERIOR OF ONE OF LONDON'S COLD STORES.
(Notice the deposit of snow and ice on the roof.)

Importation of Frozen Meat. In 1873 a cargo of mutton was brought from Melbourne, but arrived in an uneatable condition. Another experiment two years later was more successful. The beef, which this time came from the United States, was in fair condition, but it was evident that a more effective freezing machine was required. The ammonia freezing machine, invented by Edward Carré about 1860, was then employed, and in 1880 the "Strathleven" brought four hundred carcases of mutton from Australia in good condition. Out there the meat had cost twopence a pound, and it was sold in Smithfield market for sixpence.

Since that time the quantity of imported meat has been steadily increasing, until before the War it amounted to about half of the total consumption. The United States, owing to their growing requirements at home, gradually decreased exports of beef and Argentina gradually increased them, so that the trade in this food has been transferred from North to South America. The chief sources of supply of mutton are still the grassy uplands of Australia and New Zealand. Nor is the food supply from distant sources limited to meat. For "refrigerated" vessels now carry dairy produce and fruit from Canada, Australia, New Zealand, and South Africa, as well as from Holland, Denmark and France, nearer home.

Effect of development of Transportation on Population. When the clergyman Malthus wrote his learned Essay on the "Principles of Population" in 1798, he pointed out that the tendency was for the population of a country to increase more rapidly than the production of food, and that the ultimate results, if the increase was not checked by war or pestilence, was starvation. At that time the population of England and Wales was nine millions; to-day it is thirty-six millions—four times as great. It has, as he predicted, outgrown the power of the native soil to provide the necessary supply of food. But he could not foresee that the steamship and the refrigerating machine would increase the area from which food could be brought to practically the whole world. He saw only the land enclosed by the broken coastline of these islands. That was the "land" from which the people who dwelt therein would draw their means of sustenance. The North American prairie, the pampas of the Southern continent, the grassy uplands of Australia and New Zealand, the South African veldt, and the rich black soil of Southern Russia were, to him, and to all men of his day, as remote as if they had been on another planet.

Condition of the Labourers. While British agriculture lay under the shadow of depression the condition of the labourer was wretched in the extreme. Except on the estates of the more enlightened landlords the houses in which they lived were poor, insanitary hovels, without even a garden by which they might have supplemented the miserable wage of twelve to fourteen shillings a week. The Agricultural Labourers' Union, founded by Joseph Arch in 1872, demanded sixteen shillings a week and a nine and a half hours day, and in the first few years of its existence wages rose a little. But throughout the eighties the depression was getting worse and the Union died in 1894—the year in which the price of wheat reached its lowest level.

Revival of Agriculture—Small Holdings. Since that year, but more particularly since 1907, agriculture from a variety of causes became more profitable, especially to those who farmed on a large scale and had sufficient capital. The great need, however, has been and still is labour. There has been a continuous flow of men from the country to the town, which provided higher wages and more excitement in contrast to the dull monotony of village life. Attempts have been made, of which the Small Holdings Act of 1907 is an example, to attract men to the land. In Holland and Denmark, where the peasant proprietorship has never been destroyed as it was in England in the eighteenth century, there are many thousands of small farmers who are highly prosperous, and it was felt that men would be willing to return to the land if it was their own. Consequently the Act enabled County Councils to purchase land to sell it again, on the hire-purchase system, in lots of from five to fifty acres.

The farmers in the Netherlands, however, have a long tradition behind them which the British Small-holders lack, and the co-operative movement by which they buy and sell in large quantities is strongly organised among them. Without this co-operation Small-holders cannot compete with the farmer who works on a large scale, except in pigs, poultry, and dairy farming on the larger and market gardening on the smaller holdings.

Possibilities of British Agriculture. The experience of the War has shown conclusively that British soil can supply a much greater proportion of the home demand than it has done for the last forty years. What is needed is more machinery, more and better paid labour, better organisation and greater use of the scientific discoveries of the last quarter of a century. The machinery is at work and more is coming. The wages have more than doubled, great activity has been displayed in organisation, and liberal Government aid has been promised for scientific research. Most, if not all, counties are setting up Farm Institutes where the young farmer can become acquainted with the latest discoveries and best practice of his time.

Questions and Exercises on Chapter XXX.

1. In what way did the Government endeavour to aid Agriculture after 1875 ?

2. How did the farmer help himself ?

3. By what means has a serious shortage of meat been avoided ?

4. Explain what is meant by the Small Holdings Movement.

5. Contrast the Small Holdings Movement with the general tendency in manufacturing industry.

CHAPTER XXXI

EDUCATION AND THE FRANCHISE

Political Effect of Changes in Methods of Industry, Transport and Communication. It will be understood from what has been said in previous chapters that great changes in the methods of industry and the facilities for transport and communication lead to equally important changes in the way in which the country is governed. Thus the mechanical inventions of the eighteenth century led to the growth of powerful interests in the towns, and the Reform Act of 1832. Political influence passed from landlords to manufacturers. The immediate result was the Municipal Corporations Act, which conferred larger powers of self-government to the towns, and the Poor Law which set up Boards of Guardians and overseers, and enabled a rate to be levied to relieve distress. More remotely it led to the Public Health Act of 1848, and the final establishment of Free Trade in 1849.

Extension of the Franchise. Similarly, the revolution in transport and communication between 1820 and 1870 led to the Reform Act of 1869, the immediate consequences of which were the Education Acts of 1870 and 1876. The chief influence in politics was now vested in the middle classes of the towns. But it could not stop there, and the extension of the Franchise was only complete with the Act of 1885, which gave the vote to men in country districts on much the same qualifications as those who dwelt in more populous places. Four years afterwards the establishment of County Councils completed the system of Local Government which had begun in 1832.

Lastly, in the third period there have been similar widening consequences. Trams and motor cars have come to the aid of the railway; steamships have grown larger, swifter, more numerous; travelling is cheaper and easier; the telephone and the cheap telegram have brought people closer together; and everyone has been compelled by law to be educated at least up to a certain standard. Let us examine the results of these changes more closely.

Education Acts. First there is the Education Act of 1902. One motive for this Act was to render aid for voluntary schools which before 1870 had provided all the education which the poor could receive, and which, since 1870, had gradually become less efficient in comparison with the rate-aided Board Schools. But what is of greater importance for us is the fact that it provided for the first time a State system of Secondary Schools. It abolished School Boards, placed the duty of supplying Education in the hands of the County and Borough Councils (except in Scotland where School Boards remained, and in Ireland where a different system is in force); and enabled a rate to be raised for Secondary and Higher Education, which were not and still are not compulsory.

The twelve years from 1902 until the War witnessed great developments. Secondary Schools were built, scholarships were established, and a large and increasing number of boys and girls received at a comparatively low cost a more liberal education than that which could be given in Elementary Schools. They benefited not more by what they learnt than by the discipline, habits of industry, and power of self-improvement which they acquired. People who could afford it had always kept their sons and daughters at school until they were seventeen or eighteen. It was good for them and good for the country; by increasing the number of schools and decreasing the cost of secondary education, the Government were endeavouring to secure a larger number of well-trained and well-informed citizens.

But the number whose parents could afford to keep them at school beyond fourteen years of age was only a small proportion of the total number of children in the country. Here was knowledge growing yearly, daily, hourly; and here were the responsibilities of citizenship increasing with every Act which Parliament saw fit to make. Unless the school age could be raised, so that learning and discipline grew with knowledge and responsibility, boys and girls would fall behind. There would be an ever-widening gap between what they were and what they ought to be. Something had to be done to prevent this catastrophe.

The remedy was clear enough—there must be a longer period of education. But how was this to be secured. Many boys and girls had to go to work as soon as they were able in order to relieve the burden on their parents. They themselves and their younger brothers and sisters were growing older, needing more food and more expensive clothing. If they were to remain at school there must be no fees and maintenance grants must be given. The cost of this to the country would have been very great, and unless there was an enormous body of the general public in its favour no Minister of Education dare propose it.

Legislation of 1918. As there is not, and never has been a very strong public opinion in favour of education in England, an Act raising compulsorily the age of full attendance at school to sixteen was not possible. So a compromise was made, and the Act of 1918 makes full-time attendance compulsory up to fourteen, and eventually part time attendance for 320 hours a year (say a day a week) up to eighteen. Owing, however, to the opposition of certain employers and others who do not believe in education, the Act does not come into force with regard to young people over sixteen for the first seven years. But even with this limitation it is one of the most important Acts ever passed by the British Houses of Parliament.

This increase of educational opportunity has again been accompanied by an extension of the Franchise. By the Franchise Act of 1918 the right to vote in Parliamentary elections has been given to all men, and to women who are over thirty years of age or are already entitled to vote at municipal elections. The effect of this is to add nearly 8,000,000 voters to the register—that is to give nearly 8,000,000 men and women a responsible share in the government of the country. Further, the extension of the franchise to all women of more than 21 years of age is now (1920) under consideration. The control of the nation's affairs, the national destiny, has thus passed gradually out of the hands of a privileged class into the hands of practically the whole body of the people. In the language of historians the constitution has been changed from an aristocracy to a democracy. The government may be good or bad, but the election is in the hands of the people, and if they select badly, they get, if not the government they want, at least the government they deserve.

QUESTIONS AND EXERCISES ON CHAPTER XXXI.

1. What were the main objects of :
    - (*a*) The Education Act of 1870 ?
    - (*b*) The Education Act of 1876 ?
    - (*c*) The Education Act of 1902 ?
    - (*d*) The Education Act of 1918 ?
2. What was the main effect in regard to the franchise of :
    - (*a*) The Reform Act of 1832 ?
    - (*b*) The Reform Act of 1869 ?
    - (*c*) The Franchise Act of 1885 ?
    - (*d*) The Franchise Act of 1918 ?

CHAPTER XXXII

MAKING HISTORY

Makers of History. The people who are dead made History ; the people who are living are making it to-day ; and boys and girls now at school will be making it to-morrow. It is not an easy task, because no one has a free hand ; he has to take up the work where the man before him left it off. Successive generations forge the links in an endless chain, of which one end lies away back at the beginning of time and the other points to the vague and mysterious future. Many men think that the whole design of the chain is wrong and the new links should be forged differently ; but most people are conservative and prefer to avoid sudden and violent changes.

History is a record of the life and work of the people viewed from all sides, and how largely life and work in different ages has been influenced or even controlled by the methods of agriculture and industry, and by the means of transport and communication, has been abundantly shown in the preceding chapters.

Life in the Middle Ages compared with Life To-day. Thus many of the customs of the medieval manor were so closely connected with the methods of cultivating the soil that the two cannot be considered separately. Again, the wider and richer life from 1550 to 1700 was an outcome of the invention of printing and of the improvements in navigation and seamanship which made the world both greater and smaller than it was before. But it is in the eighteenth century that the connection becomes more obvious and more important ; for the steam engine, the improvements in the manufacture of iron and steel, and an immense flood of mechanical invention and scientific discovery created conditions of life the like of which had never been known before.

It is for this reason that the history-makers of to-day have a vastly more difficult task than those of by-gone years. The men who forge the links have to look ahead and behind and on each side of them, because no man works alone. He has companions to whom he gives aid and from whom he receives aid in return. But while in the old days men worked in small groups, each more or less independent, men are to-day bound by ties of mutual service all over the world.

A man who lived on a medieval manor ate bread made from wheat which had been sown on land ploughed by himself and his neighbours and ground in the village mill. A man to-day eats bread made from wheat of which at the most a portion only has been grown on native soil. A part, as a rule, of every loaf was contained in the golden carpet which in summer stretches its unbroken length and breadth over the Canadian prairie as far as the eye can see ; or was ripened under an Argentine sun ; or, again, bent to the breeze which swept over the level plains of Hungary ; or, yet again, drew its nourishment from the black earth of Southern Russia.

The man of the Middle Ages was related, through his daily bread, to a dozen, or twenty, or at most, not more than a hundred people. The man of to-day is helped by many thousands—farmers, railwaymen, dockers, and sailors, millers and bakers, clerks in offices and clerks in banks, postmen and telegraphists, the men who watched the weather reports and forecasted the crop, the men who printed the crop reports and the market prices in the newspapers, the people who sold the papers, the men who designed and the men who made the newspaper machinery and telegraph apparatus, the railway train and the steamship, the mill which ground the corn. He is helped, indeed, by the men who provided coal and iron and other things without which those to-day who were not hunters or fishermen or cultivators of the soil or breeders of stock, would starve.

A man in the Middle Ages wore garments of wool from his own sheep carded and spun by the women and children of his own family and woven by his neighbour the weaver. A man to-day who wears a woollen garment owes his warmth and comfort to a lonely sheep farmer on the grassy uplands of Australia or New Zealand, to the men of the railway, the docks, the steamship and the mine, to clerks, and workers in textile factories, to thousands whom he has never met and with whom he will probably never exchange a word.

Do unto others. And the modern man meets this indebtedness as his predecessor did by rendering service in return. No man's work is a merely personal matter—a matter in which he alone is concerned. Every man who is doing something that needs to be done, is helping to carry on the work of the world. That fact makes the meanest task to-day a greater, nobler thing than it ever was before in the world's history.

It is evident then that if a man does not do his work well he is injuring not merely himself or his employer, but many others who depend upon him. And as he, in turn, is dependent upon them he ought to play fair and do the best he can for them if he expects them to do the best they can for him. Moreover, he ought to do it willingly, because he enjoys a hundred things or services while he hardly provides a fraction of one for himself. The man of the Middle Ages received little and owed little ; the man of to-day gives relatively far less and owes relatively far more.

Freedom—and Responsibility. In one sense the story of English History is a story of the growth of political and religious freedom. In the old days a man was liable to lose his head if he were merely suspected of holding certain opinions. To-day men can think as they like, speak as they wish, act as they choose, worship as they will, without interference. The very discoveries and inventions which have played so large a part in securing civil and religious liberty have, however, made men economic slaves ; and many people to whom the idea of liberty is more precious than anything else are disposed to resent scientific and technical progress on that account.

The Law of Mutual Service. But is it quite true that people are politically free ? True, they have a legal right to think, and within limits, to act as they like. They have extensive rights—far greater rights than the men who ran the world before them. Surely, however, they have responsibilities. Surely, neither in living nor in getting a living, does any man stand alone. Has he not to consider before he exerts his influence in politics not merely how it will affect himself but also how it will affect others ? Has he not to realise that he is as helpless without them as they are without him, and that he may have to sacrifice a little in order that all may gain in the end ?

The chief difficulty which a man has in coming to a decision—a fair, just, equitable decision—on industrial and political questions, is the fearful complexity of modern industry, commerce, and the machinery of government. Each of us works in a narrow and ever-narrowing field, grinding out for himself a mere rut in which he has to tread the daily round, the common task. We have little time for reading or reflection or travel; and we see only a small part of the huge machine. Is it not the more necessary, therefore, that we should exercise moderation in our views and avoid haste in our judgments?

This does not mean that we are to stand still. The world moves and we must move with it. But the very complexity of modern life renders it necessary that the movements should be small rather than large, slow rather than rapid, smooth and strengthening rather than violent and disruptive. The growth of centuries once destroyed could not be renewed in a day. The world is imperfect now partly because it is a product, not merely of the intelligence and virtues, but also of the passions and prejudices of man. It is imperfect partly because technical progress has been so rapid that men have not had time to adjust themselves to the new conditions. It is imperfect, again, partly because we have higher standards to-day than we had a century ago.

But a fuller and more widespread knowledge of the past and the present will enable the problems of the future to be foreseen. An increasing number of well-informed men and women will set to work deliberately to make the world a better place than they found it. These men and women of the future are the boys and girls of to-day—the History Makers of the Twentieth Century—and here is the task ready to their hand.

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